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This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Favorable Effects of X-Irradiation on the Yield of Buckwheat

"X-Irradiation as a Factor for Increasing the Yield of Farm Crops," by I. G. Strona, Ukrainian Order of Lenin Scientific Research Institute of Plant Growing, Selection, and Genetics; Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, No 4, Apr 60, pp 110-112

The author summarizes the use of radiation energy, especially X-irradiation, for obtaining hereditary changes (radiation selection) and for increasing the yield of farm crops.

In the research described, buckwheat seeds were subjected to various doses of X-irradiation.

The results obtained indicate that irradiation of buckwheat by 500 r was not reflected in either morphological or physiological indexes; but irradiation by 1,000 and 1,500 r resulted in a favorable effect on the development of the plants: the plants were stronger, the growth was more profuse, blooming began 1-2 days earlier and lasted 2-3 days longer, and fertilization was more complete.

The effect of X-irradiation was clearly evidenced by the yield of the irradiated crop, but was noticeable also in the yield of the first-generation crop. The irradiation dose of 1,500 r was the most favorable, but a larger dose (2,000 r) decreased the yield of the farm crop.

The author recommends further research on the use of X-irradiation under production conditions for developing effective doses for treating dry seeds. This would decrease the labor spent in the presowing treatment of seeds.

2. Bacterial Splitting of Some Organophosphorus Compounds

"Splitting of Some Organophosphorus Compounds by B. megatherium var. phosphaticum," by Ye. Ya. Rashba and G. M. Laushnik, Institute of Microbiology Academy of Sciences USSR; Kiev, Mikrobiologichnyy Zhurnal, Vol 22, No 2, 1960, pp 22-26

The authors investigated the capability of several cultures of phosphorus bacteria to split adenosintriphosphoric, rybonucleic, and desoxyrybonucleic acids and glycerophosphate, phytin, and lecithin--substances which are found in animal and plant residues and which can serve as sources of inorganic phosphorus in the soil.

It was established that B. megatherium var. phosphaticum is able to split the above-mentioned organophosphorus substrates with the separation of inorganic phosphate. The long incubation periods, it was observed that the bacteria themselves absorbed inorganic phosphorus.

II. CHEMISTRY

Analytical Chemistry

3. Determination of Rhenium With Methyl Violet

"Investigation of the Reaction of Rhenium With Methyl Violet; Part 3--Composition of Compounds Formed by Rhenium With Tri-phenylmethane Dyestuffs and the Colorimetric Method of Determining Rhenium," by A. T. Pilipenko and V. A. Obolonchik, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 26, No 1, Feb 60, pp 99-106

It was established in earlier work done by the authors that molybdenum interferes with the colorimetric determination of rhenium. However, the compound formed by rhenium with methyl violet can be separated by extraction with aromatic hydrocarbons from the analogous molybdenum compound which is not soluble in these hydrocarbons. In the work described in this instance, the interactions of rhenium present in the form of ReO_4^- ions with crystal violet, malachite green, and brilliant green were investigated. It was established that a compound in which the ratio of rhenium to crystal violet amounts to 1:2 forms at optimum values of pH and that a compound with a ratio of the dyestuff to perhenate equal to 1:1 is formed at $\text{pH} = 1.8$. A colorimetric method has been developed by which one can determine rhenium present in concentrations down to $10^{-4}\%$ with a mean error of $\pm 10\%$. This method was applied in the analysis of Cu-Mo concentrate (0.0023 % of Re), dust separated from the waste gases of a converter department (0.012% of Re), and BMZ [Bryansk Metallurgical Plant?] matte (0.0014% of Re).

Chemical Technology

4. Development of Technological Processes for the Production of Plant Growth-Stimulant

"Production of Gibberellin and Determination of Its Physiological Activity in Connection With Its Application in Plant Growing," by M. Kh. Chaylakhyan, N. A. Krasil'nikov, A. G. Kuchayeva, K. I. Ivanov, L. P. Khlopenkova, I. V. Aseyeva, and B. F. Kravchenko, The Institute of Plant Physiology imeni K. A. Timiryazev, the Institute of Microbiology of the Academy of Sciences USSR, the Chair of Soil Biology of the Moscow State University imeni M. V. Lomonosov, and the Kurgan Medicinal Preparations Plant, Kurgan; Moscow, Fiziologiya Rasteniy, Vol 7, No 1, 1960, pp 112-120

To produce large quantities of gibberellin for widespread testing, work was started in the Academy of Sciences USSR at the beginning of 1958 for the purpose of obtaining gibberellin from an available strain of the

Fusarium spec. fungus. The gibberellin preparation obtained under laboratory conditions was tested by a biological method on *Rudbeckia* rosettes and exhibited a high physiological activity in respect to the effect on the growth and development of plants which was not inferior to that of Gibberellin A₃ (or gibberellic acid) obtained in the US.

Further studies were carried out at the Karpov Pharmaceutical Experimental Plant where the technological process and a method of chemical purification of the gibberellin preparations were developed. The gibberellin obtained under semi-industrial conditions was also found to possess a high physiological activity. Two new methods were developed, in addition. One is a fluorescence method, and the other, a biological test on maize leaves. This permitted one to determine more rapidly the gibberellin activity of the culture media and preparations.

The final stage of the investigation was carried out at the Kurgan Medicinal Preparations Plant. A provisional production schedule has been worked out here, including specifications for the initial raw materials and equipment, a description of the technological process, time and material expenditure standards, production control, and safety procedures. The gibberellin produced in large quantities under such production conditions showed that it possessed a high physiological activity and could be recommended for further tests for the purpose of ascertaining its suitability in plant growing.

Fuels and Propellants

5. Isomerization of Tetranitroalkanes

"The Isomerization of Tetranitroalkanes," by S. S. Novikov, A. A. Faynzil'berg, S. A. Shevelev, I. S. Korsakova, and K. K. Babiyeviskiy, Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, 1 Jun 60, pp 846-849

It was established by the authors that under the action of an alcoholic solution of ammonia, 1,1,1,3 - tetranitropropane is isomerized into symmetric tetranitropropane (S. S. Novikov, A. A. Faynzil'berg, S. A. Shchevelev, and others, Doklady Akademii Nauk SSSR, Vol 124, 1959, p 589). In the investigation described in this instance, it was found that this isomerization is produced, not only by ammonia, but also by other alkaline reagents such as potassium acetate and potassium methylate. The nature of the solvent has an effect on the yield of the isomerized product. With some solvents, no isomerization takes place. For instance, when a mixture of acetone and alcohol is used as the solvent and potassium acetate as the isomerizing agent, there is merely splitting off of a nitro-group from 1,1,1,3 - tetranitropropane, and the only product formed is 1,1,3 - trinitropropane.

To establish whether the isomerization reaction is specific for 1,1,1,3 - tetranitropropane only or quite generally applicable to compounds of this class, the behavior of 1,1,1,3 - tetranitrobutane and 1,1,1,3 - tetranitropentane toward alkalis was investigated. As distinguished from 1,1,1,3 - tetranitropropane, the higher homologs exist both in a nitro-form and an aci-form (S. S. Novikov, K. K. Babiyeviskiy, and I. S. Korsakova, Doklady Akademii Nauk SSSR, Vol 125, 1959, p 560). It was found that both the nitro-form and the aci-form of 1,1,1,3 - tetranitrobutane undergo isomerization to 1,1,3,3 - tetranitrobutane. Only the aci-form of 1,1,1,3 - tetranitropentane isomerizes, and the isomerization takes place in the presence of one alkaline reagent only, i.e., potassium acetate. The nitro-form of this compound is not isomerized at all, no matter what alkali is used. Ammonia is ineffective in bringing about the isomerization of either 1,1,1,3 - tetranitrobutane or 1,1,1,3 - tetranitropentane. This applies to both the nitro- and aci-forms of these compounds.

Because the aci-form of 1,1,1,3 - tetranitroalkanes isomerizes with greater facility than the nitro-form, it is concluded that any isomerization of a compound of this class present in its nitro-form is preceded by the preliminary stage of rearrangement of the nitro-form into the aci-form.

6. Peroxide Compounds of Barium

"Investigation of Systems With Concentrated Hydrogen Peroxide; Part 19--Investigation of the Properties of Peroxidic Compounds of Barium," by S. Z. Makarov and N. K. Grigor'yeva, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskoy Nauk, No 7, July 59, pp 1163-1168

Data obtained in thermochemical research with the use of a recording pyrometer and also results of investigation of the decomposition of peroxidic compounds of barium made it possible to establish that substances having a composition which corresponds to the following formulas exist: BaO ; $BaO_2 \cdot 8H_2O$; $BaO_2 \cdot H_2O_2$; and $BaO_2 \cdot 2H_2O_2$. Dehydration of $BaO_2 \cdot 8H_2O$

leads to gradual transformation into BaO_2 without formation of any intermediate hydrates. Decomposition of $BaO_2 \cdot 2H_2O_2$ may proceed over the intermediate stage of $BaO_2 \cdot H_2O_2$ or over $BaO_2 \cdot 2H_2O$, which does not exist as such. $BaO_2 \cdot 2H_2O_2$ is a relatively stable compound if residual water and residual hydrogen peroxide have been removed from it by drying over sulfuric acid at 0° . Anhydrous barium peroxide is a completely stable compound in the dry state; intensive decomposition of this compound begins at temperatures above 500° .

7. Determination by a New Method of the Velocity Constant of the Reaction Between Atomic Oxygen and Molecular Hydrogen

"Determination of the Velocity Constant of the Reaction Between Atomic Oxygen and Molecular Hydrogen," by V. V. Azatyan, V. V. Voyevodskiy, Corresponding Member Academy of Sciences USSR, and A. B. Nalbandyan, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, 1 Jun 60, pp 864-867

The reaction $O + H_2 = OH + H$ plays an important role in the mechanism of many oxidation reactions... No reliable data on the energy of activation of this reaction, which is determined on the basis of the relation between the temperature and the velocity constant of the reaction, have been available hitherto. The velocity constant of the reaction was determined by measuring the first ignition limit of carbon monoxide-oxygen mixtures in the presence of small quantities of hydrogen, additions of which have the effect of changing this limit to an extent depending on the quantity that has been added. The following result was obtained:

$$k = 1.5 \times 10^{-10} \exp \left(- \frac{12100 \pm 400}{RT} \right) \text{ cm}^3 \text{ molecules}^{-1} \text{ sec}^{-1}$$

Geochemistry

8. Geochemical Methods of Exploring for Rare Elements

"Geochemical Methods of Exploring for Rare Elements," by Ye. S. Burkser, Corresponding Member of Academy of Sciences Ukrainian SSR, and B. F. Mitskevich, Institute of Geological Sciences, Academy of Sciences Ukrainian SSR; Kiev, Doklady Akademii Nauk Ukrainiskoy SSR, No 3, Apr 60, pp 349-352

The results are given of studies having as their aim the elucidation of the possibility of employing geochemical methods of exploration for concentrations of rare elements -- zirconium, beryllium, scandium, lanthanum, yttrium, gallium, and lead.

The researches were conducted within the northwestern part of the Ukrainian crystalline shield.

On the basis of a study of the mobility of the enumerated rare elements in natural waters, soil, and plant organisms, concrete conclusions are drawn as to the effectiveness of hydrochemical and biogeochemical methods for their exploration in the given territory.

Industrial Chemistry

9. Synthesis and Properties of Some Polyorganosiloxanes That Contain Fluorine

"Synthesis and Investigation of the Properties of Polyorganosiloxanes Containing the Groups $p\text{-FC}_6\text{H}_4$, $-(\text{CH}_2)_3-\text{O}-\text{CF}_2\text{CF}_2\text{H}$, and $-(\text{CH}_2)_3-\text{O}-\text{CF}_2\text{CF}_2\text{H}$," by N. Ye³ Rodzevich, K. P. Grinevich, G. V. Obadashyan, and V. A. Ponomarenko; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 957-961

Investigation of the reactions which take place when trimethylchlorosilane, dimethyldichlorosilane, and methylphenyldichlorosilane are hydrolyzed together with different fluoroorganosilicon chlorosilanes indicated that there is predominantly formation of products of a linear structure. By investigating the properties of compounds containing 5 atoms of silicon in the molecule, it was established that the freezing points of the fluoro-organosiloxanes in question lie in the region of minus 65 to minus 70 degrees, i.e., approximately at the same level as that of polymer - 6, which does not contain any fluorine.

The energy of viscous flow of fluoroorganosiloxanes was found to be somewhat higher than that of the viscous flow of organosiloxanes of the same structure. However, the temperature coefficient of viscosity in the region of 20-98 degrees is higher for all compounds containing fluorine than for the corresponding liquid siloxanes that do not contain fluorine.

10. Aromatic Polymers -- Possible Semiconductor and Heat Resistant Materials

"The Preparation and Properties of Some Aromatic Polymers," by A. A. Berlin, B. I. Liogon'kiy, and V. P. Parini, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, 1960, pp 689-697

Linear polyaromatic compounds of an average molecular weight up to 3000 have been obtained by the reduction of bis-diazotized benzidine and of benzidine-3, 3' -dicarboxylic acid with cuprous salts. Such compounds contain, besides the benzene rings, a small amount of azo groups (less in the case of the carboxylate polymer than the other polymer) in a conjugated chain. The infrared spectra and the anomalous viscosity point to the inclusion of the benzene rings as paraphenylene groups, a quinoid structure of the chain, and a straight-line structure of the polymer molecules.

The presence of unpaired electrons in the final product in a concentration of 10^{18} - 10^{19} per gram of substance and the existence of paramagnetism confirm the radical character of the reaction.

The relatively short length of the polymer chains may be explained by the formation of stable radicaloids incapable of further growth under the conditions of the reaction.

The presence of such formations has been confirmed by the interaction of the polymers obtained with p-diethynylbenzene, resulting in the formation of nonmelting, insoluble products.

Considerable interest is being evinced at present toward the synthesis of linear polyphenylenes. Compounds of this class, which possess a continuous conjugated chain, may be expected to exhibit semiconductor and conductor properties and also to have a high degree of thermal stability.

11. Application of Polyacrylamide for the Clarification of Water

"Water Becomes Pure," by S. Ivanenko (Stalino); Moscow, Ekonomicheskaya Gazeta, No 8 (680), 9 Jun 60, p 4

It was established that polyacrylamide is a very effective coagulant for the clarification of water, particularly in connection with the treatment of water used in the enrichment of coal. At the Yasinovskiy Coke-Chemical Plant imeni A. Shevchenko, located in the Donets Basin, the largest production of polyacrylamide in the USSR has been organized. This coagulant is used at many coal enrichment plants of the Stalino Economic Region. Tests conducted by the All-Union Scientific Research Institute of Hydraulic Coal Mining (VNIIGidrougol') under industrial conditions at the Polysayevskaya hydraulic coal mine in the Kuznetsk Basin have shown that polyacrylamide is a most effective coagulant for the clarification of sludge water that accumulates in connection with the production of coal by the hydraulic method.

The new coagulant will be used extensively in different fields of the national economy. Its application will result in the saving of hundreds of millions of rubles.

12. Application of Flocculants of the Polyacrylamide Type in the Hydrometallurgy of Uranium and of Other Metals of Importance in Nuclear Technology

"Flocculation of Pulps and Synthetic Flocculants of the Polyacrylamide Type," by I. A. Yakubovich; Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, pp 535-541

Processes of the separation of hydrometallurgical pulps into a solid and liquid phase followed by washing to remove soluble substances from the dispersed solid particles are of importance in technological procedures for the treatment of ores and concentrates of uranium, lithium, zirconium, and other metals. Flocculation of pulps facilitates separation of the solid phase and makes washing of the separated solids easier. This article describes methods for the production of flocculating reagents and the properties of these reagents. Results are reported that were obtained in the investigation of processes of the flocculation of aqueous, acidic, and carbonate hydrometallurgical pulps. The information contained in the article is stated to be of interest of specialists engaged in work on the enrichment of ores and on the hydrometallurgy of uranium and rare metals.

On the basis of laboratory research and experience acquired in practical applications in the coal and metallurgical industries outside of the USSR, it is held that the most effective flocculants are those of the polyacrylamide type. Among them are Separan 2610 (produced in the US by the Dow Chemical Co), a polyacrylamide developed by the Institute of High-Molecular Compounds and the Institute of Halurgy, and the AMF polyacrylamide flocculant produced at one of the enterprises of the Gor'kiy economic region according to a method developed by the author. The process for the production of AMF, which is based on the acidic hydrolysis of acrylonitrile, is described in some detail. Results reported in the article which pertain to hydrometallurgical applications were obtained with the use of AMF.

Insecticides

13. Synthesis of New Organophosphorus Insecticides

"Esters of Arylfluoro- and Arylfluorothiophosphinic Acids," by L. M. Yagupol'skiy and Zh. M. Ivanova, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1284-1287

Alkylfluorophosphinic acid derivatives have not heretofore been used as insecticides because of their high toxicity to warm-blooded animals. The replacement of the alkyl with an aryl group usually decreases the toxicity of these compounds. In this work, the authors have carried out

the synthesis of esters of arylfluoro- and arylfluorothiophosphinic acids for the purpose of studying their insecticidal properties. The acid difluorides of arylphosphinic acids necessary for this purpose were described in an earlier report by the authors. The acid difluorides of arylthiophosphinic acids were obtained with good yields from the corresponding acid dichlorides by the action of zinc fluoride: the reaction begins after slight heating and continues violently with the evolution of a great quantity of heat. The physical constants of three compounds of this type, $RC_6H_4P(S)F_2$, where $R = H, CH_3$, or Cl , have been determined and are listed.

The atoms of fluorine in the acid difluorides of aryl- and arylthiophosphinic acids do not have an identical chemical activity. This permitted the preparation of a number of esters of arylfluoro- and arylfluorothiophosphinic acids, $C_2H_5P(O)F(OR)$, where $R = CH_3, C_2H_5$, or $iso-C_3H_7$. Their physical constants and analytical data are presented tabularly.

The esters of arylfluorothiophosphinic acids were obtained by the action of alcohols on the corresponding acid difluorides in the presence of triethylamine and also by treating the difluorides with alcoholic solutions of alcoholates or dry phenolates. In the preparation of the methyl esters of phenyl- and p-tolylfluorothiophosphinic acids, the formation of mercaptan was observed. The quantity of mercaptan increased if the reaction was conducted with heating up to $50^\circ C$. A number of esters of phenylfluorophosphinic and phenyl- and p-tolylfluorothiophosphinic acids were prepared. Their physical characteristics are listed.

The authors state that all the prepared compounds appeared to be good insecticides. The toxicity to warm-blooded animals of several of the esters of arylfluorothiophosphinic acids did not exceed the toxicity of organophosphorus insecticides in use at present.

Nuclear Fuels and Reactor Construction Materials

14. Redox Processes During the Dissolution of Uranium Oxides in Acids

"Investigation of the Role Played by Redox Processes During the Dissolution of Uranium Oxides in Acids," by G. M. Nesmeyanova and G. M. Alkhazashvili; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 330-335

The degree of oxidation of components of the ore is of decisive importance in the extraction of uranium. Because of the transfer of uranium into the solution involves a number of diverse chemical processes and is complicated by the presence of impurities contained in the ores, one must investigate the regularities underlying the oxidation of uranium and the effects exerted by different compounds which go into solution during the process of the leaching out of uranium ores.

This article reports results obtained in the investigation of the process of oxidation of U_3O_8 and the solution of this oxide in acids as affected by compounds of divalent iron. A comparison of the oxidative capacity of different oxidizing agents with reference to uranium is given for the first time. It was established that the oxidation of tetravalent uranium is not determined uniquely by the normal redox potential. The results obtained indicate that the cause of incomplete extraction of uranium by mixtures of nitric and sulfuric acids of low concentrations in the presence of considerable amounts of iron must be sought in processes of complex-formation by Fe^{2+} , SO_4^{2-} , and NO_3^- ions.

15. Radiometric Analysis of Ore on Conveyers

"Radiometric Analysis of Ores on Conveyers," by L. N. Posik, S. I. Babichenko, and R. A. Grodtko; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 425-431

This article gives for the first time a brief treatment to the physical basis, types of equipment used, and methods applied in rapid quantitative gamma-analyses of uranium ores transported on conveyers. It is brought out that this type of determination can be applied as the principal method of radiometric analysis of ores at mines and plants. Data are given which indicate the degree of precision of results obtained for ores of different composition.

16. Spectrophotometric Investigation of the System $UO_2(NO_3)_2 - ROH - H_2O_2 - H_2O$

"Spectrophotometric Investigation of the System $UO_2(NO_3)_2 - ROH - H_2O_2 - H_2O$," by A. M. Gurevich, L. D. Preobrazhenskaya, Ye. V. Komarov, and N. P. Osicheva; Leningrad, Radio-khimiya, Vol 2, No 1, Feb 60, pp 32-43

Spectrophotometric investigation of the system $UO_2(NO_3)_2 - ROH - H_2O_2 - H_2O$ (where $R = K, Na, \text{ or } NH_4$) at uranium concentrations of $10^{-4} - 10^{-3}M$ showed that in the pH region of 2-14 there is stepwise formation of complexes, the nature of which depends on the concentration of uranium, the ionic strengths of the solution, the order in which the components have been added to the solution, and other factors. The complexes $H_2U_2O_9$, HU_2O_9 , $U_2O_9^{2-}$, UO_6^{2-} , HUO_8^{3-} , $HU_4O_{20}^{5-}$, $HU_2O_{13}^{5-}$, $U_4O_{19}^{6-}$, and UO_8^{4-} have been identified. The concept is advanced that peroxide compounds of uranium are strongly bound complexes of the uranyl ion cation with hydrogen peroxide anions. Formulas and a system of nomenclature are proposed for compounds of this type which have been investigated.

17. Heat Treatment of Uranium

"Heat Treatment of Uranium," by G. Ya. Sergeyev, V. D. Titova, Z. P. Nikolayeva, and A. M. Kaptel'tsev; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 340-347.

The article describes one of the types of heat treatment of uranium, namely, quenching, which assures that the metal has a fine-grained quasi-isotropic structure. It has been established that it is possible to increase the strength of uranium by quenching from β and γ -phases. The effect of the quenching on micrograins and macrograins, depending on the chemical composition, has been studied, as well as the tendency of uranium to creep in the temperature range in which the α -phase exists.

18. Effect of Temperature Changes on Internal Friction in Polycrystalline Uranium

"Investigations of the Increase in Internal Friction as a Result of Changes of the Temperature of Samples of Crystalline Uranium," by Yu. N. Sokurskiy and Yu. B. Bobkov; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 348-353

On the basis of the attenuation of torsional vibrations during the heating of samples, the increase of internal friction as a result of the heating of uranium samples at different rates was investigated. Samples of polycrystalline uranium quenched in the γ -phase, tempered in the γ - and α -phases, and then recrystallized were investigated. It was established that the rate of increase of internal friction of samples, in time, gradually decreases and that this increase reaches a limiting value, the magnitude of which is approximately proportional to the rate of heating of the samples. The increase in internal friction is due to strains which develop in the sample as a result of the change of temperature because of the anisotropy of the coefficient of thermal expansion. Reduction of internal stresses because of an increase in the dimensions of grains until their diameter becomes comparable with that of the sample or because a preferential orientation has been established in the sample results in a decrease of the increment of internal friction. During the process of heating, microscopic shearing deformation of the samples also takes place. A similar increase in the internal friction on the heating of samples was also observed in the case of zinc, which is a thermally anisotropic metal. This increase of internal friction was not observed in metals with an isotropic coefficient of thermal expansion, i.e., aluminum and molybdenum.

19. Melting Points of Binary Mixtures of Uranium Oxide With Other Oxides

"Determination of the Melting Points in Air of Binary Mixtures of Uranium Oxide With Other Oxides," by S. G. Tresvyatskiy and V. I. Kushakovskiy; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 56-58

The melting points of binary mixtures of uranium dioxide with beryllium oxide, magnesium oxide, calcium oxide, strontium oxide, barium oxide, aluminum oxide, lanthanum oxide, silicon dioxide, titanium dioxide, zirconium dioxide, thorium dioxide, cerium dioxide, phosphorus pentoxide, vanadium pentoxide, molybdenum trioxide, tungsten trioxide, tantalum pentoxide, bismuth trioxide, lead dioxide, tin dioxide, chromium trioxide, ferric oxide, and magnesium dioxide were determined. The determinations were carried out in the presence of air.

20. Investigation of a Spent Fuel Element From the First Soviet Nuclear Power Station

"Investigation of a Spent Fuel Element From the First Nuclear Power Station" by A. P. Smirnov - Averin, V. I. Galkov, Yu. G. Sevast'yanov, N. N. Krot, V. I. Ivanov, I. G. Sheynker, L. A. Stabenova, B. S. Kir'yanov, and A. G. Kozlov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 416-447

A fuel element of the first Soviet Nuclear Power Station was investigated that had been in use for 10^4 effective days and had been stored for 1,160 days after being used. The burn-out was determined on the basis of Cs^{137} activity. An average burn-out of 12.5% was found to have taken place. The burn-out was also determined mass-spectrometrically. By using this method, a content of uranium equal to 4.32% was obtained which corresponds to a burnout of 16.1%. The total alpha activity was measured on a standard Da-49 installation and the total β activity by means of a $^4\pi$ counter. The gamma radiation activity was determined by means of an ionization chamber standardized with radium. The results of the measurements are represented in the form of curves. The content of transuranium isotopes was determined on the basis of gamma radiation spectra and the number of spontaneous fissions. The values for the contents of plutonium-238, plutonium-239, plutonium-240, plutonium-241, and americium-241 are listed in a table.

21. Effect of the Temperature on the Extraction of Uranyl, Plutonium, Ruthenium, and Zirconium Nitrates With Tributyl Phosphate

"The Effect of the Temperature on the Extraction of Uranyl, Plutonium, Ruthenium, and Zirconium Nitrates With Tributyl Phosphate," by V. B. Shevchenko and I. A. Fedorov; Lenin-grad, Radiokhimiya, No 1, Feb 60, pp 6-12

It was established that the coefficient of distribution of uranyl nitrate drops with increased temperatures; the reaction between uranyl nitrate and tributyl phosphate is exothermic. The effect of the temperature on the extraction of uranium becomes less pronounced with increased saturation of tributyl phosphate with uranium.

The coefficient of distribution of tetravalent plutonium increases in the range of 10 - 40° C and then drops sharply. This type of extraction curve is retained when uranyl nitrate is present in the aqueous solution. At acidities lower than 0.5 N HNO₃, the extraction curve changes; the degree of extraction of Pu (IV) drops steadily with increasing temperatures. When zirconium nitrate is extracted with tributyl phosphate solutions, the maximum degree of extraction lies at 25-30°. The degree of extraction of ruthenium with tributyl phosphate from nitric acid solutions decreases from 10° to 80°. Extraction of nitric acid drops with increasing temperatures, but the effect is small in magnitude.

22. Electrolytic Separation of Small Quantities of Uranium, Neptunium, Plutonium, and Americium

"Electrolytic Separation of Small Quantities of Uranium, Neptunium Plutonium and Americium," by A. G. Samartsev; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 324-329

To investigate the nuclear properties of elements and their isotopic composition, one must deposit them in the form of thin, homogeneous layers. In the analytical chemistry of transuranium elements, it is of importance to separate these elements quantitatively. Sometimes, separation in tracer quantities is necessary. This article describes a new electrolytic method for the quantitative separation of traces of uranium, neptunium, plutonium and americium from acidic solutions. It was established that the yield of the elements in question in the process described does not depend on the anion of the electrolyte, but is determined by the pH of the solution. A method has been developed for the quantitative electrolytic separation of plutonium when different other metals are present; the effect of iron on the separation is eliminated by introducing oxalic acid into the electrolyte solution.

23. Decomposition of Plutonium Oxalates Under the Action of Alpha Radiation Emitted by Plutonium

"On the Decomposition of Oxalate Coordination Compounds of Plutonium Under the Action of Alpha Radiation," by L. P. Sokhina and A. D. Gel'man; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, 1960, pp 1013-1015

The decomposition of the oxalate ion and oxalate coordination compounds due to the action on $C_2O_4^{2-}$ of the alpha radiation emitted by plutonium was investigated. It was established that under the action of alpha radiation, $C_2O_4^{2-}$ decomposes into CO and CO_3^{2-} at low temperatures. The carbon monoxide which is formed reduces ³tetravalent plutonium to trivalent plutonium. The latter remains in the trivalent state until $C_2O_4^{2-}$ has decomposed completely. After this, it is oxidized to tetravalent plutonium. The end product of the decomposition of plutonium oxalate and of $(NH_4)_6 \cdot [Pu(CO_3)_5] \cdot n H_2O$ is the plutonium oxycarbonate $Pu OCO_3 \cdot 2 H_2O$.

The end product of the decomposition of $K_4 [Pu(C_2O_4)_4] \cdot 4 H_2O$ and $Na_4 [Pu(C_2O_4)_4] \cdot 5 H_2O$ is $Pu O CO_3$ mixed with $Na_2 CO_3$ or $K_2 CO_3$. The magnetic susceptibility of Pu (IV) and Pu (III) oxalates and also of products of the decomposition of Pu (IV) oxalate was investigated

24. Separation of Lithium Isotopes by the Ion-Exchange Method

"Separation of Lithium Isotopes on a Simple Ion-Exchange Column," by G. M. Panchenkov, Ye. M. Kuznetsova, and L. L. Kozlov; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 368-370

To investigate the separation of lithium isotopes in a simple ion-exchange column, solutions of lithium chloride, lithium citrate, lithium benzoate, and lithium hydroxide were used. Sulfonated coal was used as the ion-exchange agent. On the basis of the experiments described, it is concluded that the most efficient extraction is obtained when the solution containing lithium is introduced into the bottom part of the column and is displaced by the eluant from the bottom to the top, while the ion-exchange resin moves downwards. As a result, the separation obtained in a short section of the column becomes equivalent to that which would be produced by a column of infinite length.

25. Separation of Rare-Earth Elements by the Crystallization of Double Sulfates

"Distribution of Rare-Earth Elements Between the Solid and the Liquid Phase During the Crystallization of Double Sulfates," by Ya. G. Goroshchenko, V. I. Velokoskov, and A. G. Babkin; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 803-808

Investigation of the distribution of rare-earth elements between the liquid and solid phase during the crystallization of double sulfates of these elements (the second cation being potassium, sodium, or ammonium) from solutions of lanthanum, praseodymium, and neodymium salts containing small quantities of other lanthanides established that the coefficients of distribution of rare-earth elements during the salting-out of four double sulfates that have been investigated increase with the increasing order number of the elements. However, there are differences which depend on the nature of the solid phase. Crystallization of double sulfates with potassium and ammonium (after addition of sulfuric acid) makes it possible to concentrate in the solution rare-earth elements with an order number higher than that of samarium. Use of sodium sulfate contributes to the concentration in the solution of rare-earth elements which have an order number higher than that of europium. Ammonium sulfate used without the addition of sulfuric acid does not form difficultly soluble compounds with lanthanides of the cerium subgroup. For this reason, ammonium sulfate is not particularly well suited for the concentration of heavy lanthanides in the solution. Crystallization of double sulfates of rare earth elements with potassium, sodium, and ammonium (on addition of sulfuric acid) may be applied on a practical scale in the conversion of naturally occurring raw material when rare-earth impurities present in small quantities together with lanthanum, praseodymium, and neodymium must be concentrated.

26. Separation of Zirconium From Hafnium by Extraction With the Di-isoamyl Ester of Phosphonic Acid

"Separation of Zirconium From Hafnium by the Extraction of their Nitrates With the Diisoamyl Ester of Methyl Phosphonic Acid," by G. A. Yagodin, O. A. Mostovaya, and A. M. Chekmarev, Chair of the Technology of Radioactive, Rare, and Dispersed Elements, Moscow Chemico-Technological Institute imeni D. I. Mendeleev; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 1, Jan 60, pp 135-137

The capacity of diisoamyl ester of methylphosphonic acid to extract the nitrates of zirconium and hafnium was investigated. The dependence of the distribution factors of zirconium and of the coefficient of separation of zirconium from hafnium on the concentration of nitric acid is shown in the

form of curves. The results obtained indicate that nitric acid increases the transfer into the organic phase of both zirconium and hafnium. The dependence of the distribution factors on the concentration is of the same type as in the extraction with TBP (tributylphosphate). However, the absolute magnitude of the distribution factors is several times higher than in the case of TBP. The coefficient of separation of zirconium from hafnium has a pronounced maximum at a concentration of HNO_3 equal to 4N.

27. Complex Compounds of Zirconium and Hafnium With Hydroxyacids

"Formation of Complexes With Some Hydroxyacids by Zirconium and Hafnium," by D. I. Ryabchikov, A. N. Yermakov, V. K. Belyayeva, and I. M. Marov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1051-1067

By using the method of ion exchange, the distribution of zirconium and hafnium between the cation-exchange resin KU-2 and solutions containing 0.1 - 2 mols per liter of HCl O_4 was investigated as it is affected by a number of organic acids. It was established that acids containing OH groups have a stronger tendency toward the formation of complexes with zirconium and hafnium. Significant differences were established between the formation of complexes by zirconium and hafnium: the stability of zirconium complexes is, as a rule, higher than that of hafnium complexes. A method is proposed for the separation of zirconium from hafnium by using the KU-2 cation-exchange resin and applying a mixture of citric and perchloric acids as the eluant. The composition and constants of the formation of zirconium and hafnium complexes with tataric, malic, trihydroxyglutaric, citric, and lactic acids were determined. It was found that the stability of complex compounds formed by zirconium and hafnium with organic acids decreases in the following sequence: oxalic > mesoxalic > trihydroxyglutaric > citric > lactic > tartaric > malic.

28. Calculation of Thermal Shock for Structural Elements of a Reactor

"Calculation of Thermal Shock for Structural Elements of a Reactor," by Yu. Ye. Bagadasarov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 452-454

Thermal shock arises in the walls of structural parts of reactors because of the rapid drop in the temperature of the coolant leaving the region of the core after the reactor has been stopped because of a malfunction. An effective means of preventing damage to the walls of important parts of the reactor from thermal shock is the construction of screens which protect the carrying wall and are located between that wall and the coolant. Calculation of heat strains is carried out for flat surfaces on the assumption that the carrying wall and the protective screen are constructed of the same material.

29. Purification of Sodium From Oxides and Methods for the Control of the Oxide Content in Sodium

"Purification of Sodium From Oxides and Methods for the Control of the Oxide Content in It," by P. L. Kirillov, F. A. Kozlov, V. I. Subbotin, and N. M. Turchin; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 30-36

Oxides present in sodium which is used as a coolant expedite the corrosion of conduits and may produce clogging. Data are given on the performance of tests with cold traps for oxides, and results of work with an appliance for the determination of the oxygen content in sodium are reported. The results obtained can be used in designing experimental and industrial installations at which sodium or alloys of sodium with potassium are used as coolants.

30. Reaction of Uranium Trioxide With Solid Carbon

"Interaction of Uranium Trioxide With Solid Carbon," by V. G. Valsov and V. A. Kozlov; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 760-765

Investigation of the velocity of direct reduction of uranium trioxide in vacuum with wood charcoal in the temperature range of 350-1200° and with sugar carbon in the temperature range of 450-530° established that the kinetic characteristics of the process depend to a considerable extent on the reduction agent which is used. Wood charcoal is a more active reducing agent than sugar carbon. The energy of activation of reduction with wood charcoal was found to be 43 kilocalories per mol, and with sugar carbon, 65 kilocalories per mol. The gas phase that develops as a result of the reduction consists entirely of carbon dioxide. An attempt is made to explain the mechanism of the acceleration of the reaction of carbon monoxide regeneration, which forms the slowest stage in the process of the direct reduction of uranium trioxide.

31. Interaction of Uranium Hexafluoride With Ammonia

"The Interaction of Uranium Hexafluoride With Ammonia," by N. P. Galkin, B. N. Sudarikov, and V. A. Zaytsev; Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 69, pp 530-534.

The reactions of uranium hexafluoride with ammonia in the temperature range from minus 50° to plus 200° have been investigated. The following over-all reaction equations are proposed:

- 1) $6 \text{ UF}_6 + 8 \text{ NH}_3 \longrightarrow 6 \text{ UF}_5 + 6 \text{ NH}_4\text{F} + \text{N}_2$ (in the range from minus 50° to minus 30°);
- 2) $4 \text{ UF}_6 + 8 \text{ NH}_3 \longrightarrow 2 \text{ UF}_5 + 2 \text{ NH}_4\text{UF}_5 + 4 \text{ NH}_4\text{F} + \text{N}_2$ (in the range from 0° to plus 25°);
- 3) $3 \text{ UF}_6 + 8 \text{ NH}_3 \longrightarrow 3 \text{ NH}_4\text{UF}_5 + 3 \text{ NH}_4\text{F} + \text{N}_2$ (in the range from 200 plus 100° to plus 200°)

The reaction velocity in the range from minus 20° to plus 20° has been estimated. The heat balance of the reaction in the range from minus 50° to minus 30° changes from 50.8 to 83.6 kilocalories/mol. At minus 40° , it coincides with that calculated on the basis of the reaction equation proposed.

32. Adsorption of Uranium on the Strongly Basic Anion Exchange Resin AV-17

"Adsorption of Uranium on the Strongly Basic Anion-Exchange Resin AV-17," by A. V. Gordiyevskiy and V. I. Savel'yeva, Chair of the Technology of Radioactive, Rare, and Dispersed Elements, Moscow Chemico-Technological Institute imeni D. I. Mendeleyev; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy - Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 1, Jan 60, pp 138-140

Adsorption of uranium by the strongly basic anion-exchange resin AV-17 from carbonate solutions and solutions containing sulfuric and hydrochloric acids was investigated. The desorption of uranium from the resin was also subjected to investigation. It was established that the ion-exchange resin AV-17 is chemically stable in solutions containing nitric and hydrochloric acids. However, some decomposition takes place under the action of 10 N HCl and 8 N HNO_3 .

The monofunctional anion exchange resin AV-17, which was synthesized at the Scientific Research Institute of Plastics imeni M. V. Frunze, is obtained by the treatment with trimethylamine of the chloromethylated copolymer of styrene with divinyl benzene.

33. Centrifuging of Aerosols in a Centrifugal Rotary Dust Separator

"Tsentrifugirovaniye Aerorozley v TsRP (Centrifuging of Aerosols in a Centrifugal Rotary Dust Separator)," by S. A. Prechistenskiy, Moscow, Atomizdat, 1960, 144 pp, price 4 rubles, 20 kopeks (unsigned review); Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, p 481

This book discusses the theoretical aspects of the centrifuging of aerosols in equipment of a new type, namely, the centrifugal rotary dust separator (TsRP). Problems involved in the design and construction of

equipment of this type are reviewed. Data obtained in tests carried out in connection with the application of different technological processes are given. The book will be of use to design engineers and investigators working in the field of aerosol separation.

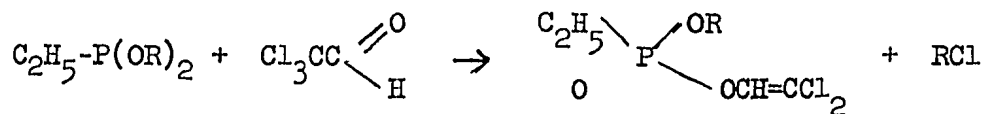
Organic Chemistry

34. Compounds Combining Antibacterial and Anticholinesterase Activity Synthesized

"Investigation in the Series of Phosphinic and Phosphinous Acid Derivatives. XII. On Several Mixed Esters of Ethylphosphinic Acid and Their Biological Activity," by A. I. Razumov and N. G. Zabusova, Kazan Chemico-technological Institute imeni S. M. Kirov; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1307-1310

The reaction between phosphites and α -halocarbonyl compounds has been studied by numerous authors. But the mechanism of these reactions is still not completely clear and has been interpreted in different ways. Apparently, the polarity of the chemical bonds of the reacting substance and also the type of conjugation influence essentially the direction of the reaction. To explain this reaction mechanism, the authors have undertaken to study the reaction between α -halocarbonyl compounds and esters of alkylphosphinous acids. These reactions are also of importance because of the fact that derivatives of alkylphosphinic acids with combined functions can be obtained. In earlier publications, A. I. Razumov and his associates demonstrated that biological activity could be expected from compounds of this type; compounds possessing high anticholinesterase activity had been synthesized prior to the work described in this instance.

Compounds with antibacterial activity are described in this article. The first result was obtained by applying the reaction of the lowest esters of ethylphosphinous acid with chloral:



No other reaction products were detected besides the esters of ethylphosphinic acid. The presence of the double bond in the molecules was confirmed by the addition of chlorine. As a result of this addition, the mixed alkoxy-1,2,2,2-tetrachloroethyl esters of ethylphosphinic acid were obtained. The yield of the latter esters was quite small.

Both type of esters, $C_2H_5(O)P(OR)OCH=CCl_2$ (I) and $C_2H_5(O)P(OR)OCHClCCl_3$ (II) possessed combined antibacterial and anticholinesterase activity. The antibacterial activity was expressed in relation to gram-positive bacteria (staphylococcus, streptococcus, and diphtheria bacilli). The chlorinated products have a relatively higher activity which can be seen from the following example: compound I, where $R = iso-C_3H_7$, is active in relation to the above mentioned bacteria in a dilution of 1:1000 at a toxicity (intravenously) of 0.91 mg/kg (for white mice), but compound II, where $R = iso-C_3H_7$, at a toxicity of 3 mg/kg, is active in a dilution of 1:10,000, i.e., one that is 10 times higher. Similar results of an investigation of the antibacterial and anticholinesterase activity of all the compounds are reported in an article by S. M. Vyaseleva, I. V. Zaikonnikova, et al. in Trude Gos. In-Ta Uovershenstvovaniya Vrachey (Works of the State Institute for the Advanced Training of Physicians), Kazan', 1959/. All of the esters are powerful miotics. Compound II, where $R = iso-C_3H_7$, and several others possess insecticidal activity, causing a 100% death of flies after a 5-minute exposure at a dose of 0.25 g of the active substance on 1 m² (according to data of the Central Scientific Research Disinfection Institute).

35. Isomerization of Alkylarsinic Acids Esters Confirmed

"The Synthesis and Pyrolysis of Esters of Alkylarsinic Acids," by Gil'm Kamay and B. D. Chernokal'skiy, Kazan Chemico-Technological Institute imeni S. M. Kirov; Moscow, Zhurnal Obshchev Khimii, Vol 30, No 4, Apr 60, pp 1176-1180

The USSR chemist Ya. F. Komissarov and his associates have shown that esters of alkylarsinic acids are isomerized into the esters of arsenous acid upon heating: $RA_s(O)(OR)_2 \rightarrow As(OR)_3$. The reaction was accompanied by the formation of the corresponding alcohols and fractions in which the content of trivalent arsenic was greater than in the arsenous acid esters that had formed. [Ya. F. Komissarov, et al., Doklady Akademii Nauk SSSR, 56, 51, 1947/.

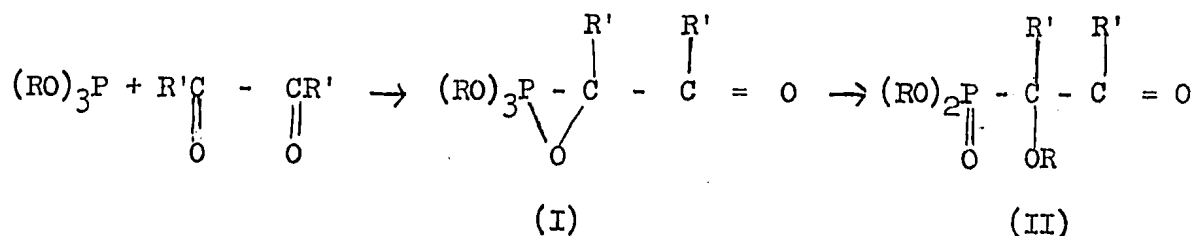
In the light of this observation, the authors have undertaken to study the behavior of esters of alkylarsinic acids upon heating on other examples. The necessary esters were obtained by oxidation of the corresponding esters of alkylarsinous acids with selenium dioxide in dry benzene.

The experiments confirmed the fact that thermal decomposition of alkyl esters of alkylarsinic acids leads to the formation of two arsenic-containing products -- esters of alkylarsinous acid and trialkylarsenite. The reaction is accompanied by the formation of an alcohol with a radical corresponding to that of the alkoxy group of the initial ester of alkylarsinic acid.

36. Addition of Trialkylphosphites to α -Diketones

"The Addition of Complete Esters of Phosphorous and Phosphinous Acids to Conjugated Systems. IX. Addition of Trialkylphosphites to α -Diketones," by V. A. Kukhtin and K. M. Orekhova, Kazan Affiliate of the Scientific Research Cinephotographic Institute; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1208-1216

In their continuing investigation of new forms of the Arbuzov rearrangement, the authors found that trialkylphosphites very actively react with α -diketones. The reaction between diacetyl and trialkylphosphites proceeds at room temperature with a considerable evolution of heat. In studying these reactions, they observed that, depending on the experimental conditions, not only can the end product of the Arbuzov rearrangement (II) be obtained, but also the intermediate product of the addition of trialkylphosphite to diacetyl:



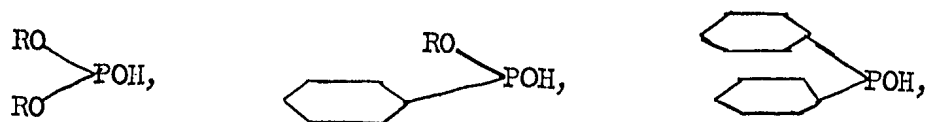
Several analogs of the intermediate product (I) (where $R' = CH_3$; $R = C_2H_5, C_3H_7, C_4H_9$) were isolated in a chemically pure form and characterized by the authors.

37. Direct Amidation of Trivalent Phosphorus Compounds

"Amidation of Several Compounds of Trivalent Phosphorus," by K. A. Petrov and O. S. Urbanskaya; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1233-1238

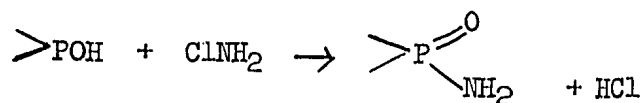
It is known that acid phosphites enter into the Arbuzov reaction with various compounds, for example, with alkylhypochlorites, sulfenylchlorides, and chloramines, yielding, respectively, the trialkylphosphates, O-dialkyl-S-alkylphosphates, and dialkylamides of dialkylphosphoric acid. These reactions, just as many reactions of medium esters of phosphorous and phosphinous acids, depend on the propensity of trivalent phosphorus to add various substances to form intermediate, usually unstable products with an onium structure which rearrange into various compounds of pentavalent phosphorus.

The purpose of the present work was to study the reaction between chloramine and compounds of the type

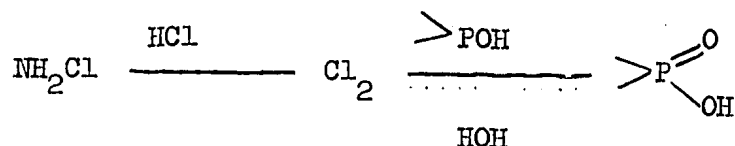


which could lead to a new method for synthesizing amides of phosphoric and phosphinic acids. Direct amidation of trivalent phosphorus compounds would be useful for preparing substances with the phosphamide group, which, like the sulfamide group, is capable of imparting pharmacological properties to compounds.

Di-n-butyl-, diisoamyl-, di-n-hexyl-phosphites, monoisoamylphenyl-phosphonite, and diphenylphosphinous acid were reacted with chloramine. The authors found that the best results are obtained if an aqueous solution of chloramine is added to the compounds mentioned with agitation and cooling (reaction temperature from -5 to $+30^{\circ}$). Under these conditions, the reaction takes place principally with the formation of a phosphamide:



The reverse order of mixing the reagents or an increase in the reaction temperature lead to the predominant formation of acid phosphates, phosphonates, and phosphinic acids:



The di-n-butyl-, diisoamyl-, di-n-hexylamidophosphates, pentoxymido-phenylphosphonate, and amidophenylphosphonate were obtained by this method.

The structural Formulas of nine compounds hither to not reported and their yields are listed in one table.

G. V. Gubin, V. M. Budanov and V. I. Teslin, and V. M. Portnov participated in carrying out the experiments.

38. Synthesis of Phenyltrichloromethylphosphorochloride

"Phenyl-bis-(trichloromethyl)-phosphin oxide, Phenyltrichloromethylphosphinic Acid and Their Derivatives," by L. M. Yagupol'skiy and P. A. Yufa, Institute of Organic Chemistry, Academy of Sciences, Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1294-1299

The purpose of this research was to synthesize compounds which contain a phosphorus atom bound to a benzene ring and one or two trichloromethyl groups. The oxide of ω, ω , -di-chlorodimethylphenylphosphine was used as the starting material.

The oxides of phenyl- and p-chlorophenyl-bis-(trichloromethyl)-phosphines were synthesized. By nitrating them, the oxides of 3-nitro- and 3-nitro-4-chlorophenyl-bis-(trichloromethyl)-phosphines were prepared. A synthesis is described of the acid chloride of phenyltrichloromethylphosphinic acid, of the complex compound of phenyltrichloromethylphosphor-trichloride with phosphorus pentachloride and its reduction product - phenyltrichloromethylphosphoruschloride.

39. Synthesis of Organophosphorus Resins Reported

"Phosphorus-Containing Polyester and Polyamide Resins," by K. A. Petrov and V. A. Parshina; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1342-1346

In contrast to organophosphorus insecticides and other physiologically active substances, organophosphorus polymers up to the present have not received wide use nor have they been described in the literature. Nevertheless, on the basis of the available information, the author firmly concludes that several organophosphorus polymers, possessing specific properties, can become practically important.

In this work, they have obtained two polyesters by the polycondensation of bis(p-carbomethoxyphenyl)methylphosphine oxide with ethylene glycol and diethylene glycol and also a polyamide by the condensation of bis(p-carboxyphenyl)methylphosphine oxide with hexamethylenediamine.

A method was developed for preparing bis(p-tolyl)methylphosphine oxide; its oxidation to bis(p-carboxyphenyl)methylphosphine oxide was perfected, and the synthesis of several derivatives of this acid, previously undescribed, was performed.

Radiation Chemistry

40. Universal Installation for Modeling Radiation-Chemical Equipment and Conducting Radiation-Chemical Investigations

"A Universal Installation With a Co⁶⁰ Gamma Radiation Source Having an Activity of 60,000-Gram-Equivalents of Radium for Modeling Radiation-Chemical Equipment and Conducting Investigations (K-60,000)," by A. Kh. Breger, V. B. Osipov, and V. A. Gol'din; Moscow, Atomnaya Energiya, Vol 8, No 8, No 5, May 60, pp 441-445

This article describes a universal installation for radiation-chemical investigations which is equipped with a Co⁶⁰ source of gamma radiation having an activity of about 60,000 gram-equivalents of radium. The design of the installation is such that one may simulate radiation-chemical equipment having isotope sources of gamma radiation of different configurations and dimensions. This includes a cylindrical unit for irradiation, an irradiation unit consisting of two planes, an irradiation unit of the heat-exchanger type, and an irradiation unit having the shape of one or several rods. The magnitude of the dose (without taking into account weakening due to protective containers) can be changed from approximately 250 r/sec applied to a volume of 36 liters to approximately 3,000 r/sec applied to a volume of 0.1 liter. The equipment is designed for conducting investigations under such conditions that practically any physical and chemical constant applying to work of this type can be matched. The installation can be controlled from a distance, and observations of experimental conditions and processes taking place in the systems investigated during irradiation can be also made from a distance.

41. Effect of Ionizing Radiation on Reactions of Nitrogen Dissolved in Water

"The Effect of Ionizing Radiation on the Reactions of Nitrogen Dissolved in Water," by M. T. Dmitriyev and S. Ya. Pshezhetskiy; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 59-62

It was established that under the action of ionizing radiation, nitrogen dissolved in water reacts forming nitrate, nitrite, and ammonia. The relative yield of these products depends on the composition of the dissolved gas and the quantity of energy that has been absorbed. The energy yield comprises 0.08-0.18 atom of bound nitrogen at a pressure of one atmosphere and 1-1.4 atoms at a pressure of 150 atmospheres per 100 electron volts of absorbed radiation energy. The probable mechanism of the radiation-chemical process involved will be discussed in a subsequent communication.

The results obtained are of importance from the standpoint of the operation of nuclear reactors in which water containing dissolved gases is used as a coolant or moderator.

Radiochemistry

42. USSR Work in 1959 Involving the Application of Isotopes and Nuclear Radiation

"Work With the Application of Isotopes and Nuclear Radiation Carried Out in 1959" (unsigned report); Moscow, Vestnik Akademii Nauk SSSR, Vol 30, No 5, May 60, pp 86-87

The Presidium of the Academy of Sciences USSR designated the most valuable work involving the application of isotopes and nuclear radiation that has been carried out during 1959 in the departments of Biological Chemical, Technical, Geological-Geographic, and Physico-Mathematical Sciences. Some of the results pointed out by the presidium are listed below.

In the field of biology, it was established that aminoethylisothiuronium, when applied in connection with radiation therapy, protects normal cells but does not protect cells of a number of malignant protoplasms. Clinical testing of this drug will be started in the near future.

The principles of a USSR rotary installation have been developed which makes it possible to apply high doses of radiation deeply within the organism and concentrate the radiation on individual human organs in such a manner that the action of radiation on other, healthy tissues and organs is sharply reduced. A radiograph and a radiotopograph have been designed which make it possible to investigate by means of gamma-emitting isotopes the physiological functions and disturbances of such functions in the organisms of animals and human beings.

It was established that there are great differences in the sensitivity of individual species and varieties of agricultural plants to the action of radiation. A table of critical doses of radiation for the treatment of 150 varieties of seeds has been compiled.

New varieties of potatoes have been developed by applying radiation; this includes varieties which give higher yields, ripen earlier, and are more resistant to infection with phytophthora. Radiation-induced mutations in wheat resulted in the development of varieties which have a reduced tendency to lodge, give higher yields, have an increased protein content, and are more resistant to some fungus infections. These varieties are now being tested. Experiments carried out in 1959 confirm that irradiation of seeds before planting in a number of cases increases the rate of growth and development of crops (this applies to cabbage, carrots, turnips, radishes, sunflowers, and some other crops).

Several gamma installations have been developed which can be used in scientific investigations and to carry out irradiation on a production scale for the following purposes: inhibition of the sprouting of potato tubers, elimination of insect pests from grain during the period of storage, and treatment of seeds before planting. The use of a new scintillator gel made it possible to develop a new and highly sensitive method for determining very low activities of radioactive substances.

A method for the direct determination of characteristics of water used in irrigation has been devised. By applying this method, undesirable increases in the salinity of soils due to irrigation can be prevented.

In the field of chemistry, a new radiation method for producing transparent organic plastic ("organic glass" -- plexiglass?) up to 250 mm thick has been developed. It was established that it is possible to polymerize hexafluoropropylene by the application of radiation. This monomer cannot be polymerized by any other means. Starting with hexene, a new elastomer derived from this monomer has been obtained by radiation polymerization.

A method has been proposed for bringing about adhesion between different polymers by means of irradiation.

A radiation-chemical dosimetry procedure has been developed which can be applied in the range of 20-1000 roentgens at temperatures from minus 80° to plus 50°. Leuco-bases of triphenylmethane dyestuffs dissolved in organic solvents are used as reagents in this dosimetric procedure. A method has been proposed for determining the charge of ions of radioactive elements in solutions by using ion-exchange resins which exhibit different swelling capacities.

In geology, a method has been developed for pulse neutron-neutron well logging which makes it possible to determine the location of interfaces between water and petroleum or liquid and gas with a great reliability and a high degree of precision. Rapid radioactivation methods have been proposed for determining the content of a number of elements (aluminum, manganese, silicon, and others) in rocks. Prototypes of equipment for field radioactivation analysis have been constructed.

So far as technological applications are concerned, the equipment of the Voronezh nuclear power station has been investigated, specifically, the turbine moisture separator there. A new method has been developed for purifying radioactive waters by a procedure involving complete evaporation of the water. An experimental check has been made of the principal part of the flow sheet, and the critical heat fluxes have been determined by employing a model of the [core] assembly ("bundle") of the water-cooled, water-moderated, power-producing reactor. The thermodynamic properties, viscosity, and heat conductivity of helium have been investigated at high

pressures and temperatures. A method has been developed for investigating stresses in complex construction elements of the framework of new power-producing equipment. Models made of plastics are applied in work of this type. Electronic strain gauges have been designed for measuring, over long intervals of time, thermoelastic strains in models constructed of metals and for conducting investigations on testing stands.

For the purpose of controlling technological processes applied in ore enrichment, a method involving the use of a nuclear reaction has been proposed by which different elements contained in ores and rocks can be determined. A method has been developed for the dry enrichment of coal that is based on the weakening of the intensity of gamma-radiation passing through the coal to an extent which depends on the content of inorganic matter. By applying this method, one can carry out automatic control of the separation of rock from coal, enrich the coal up to a predetermined value of the ash content, and automatically control the separation of pyrite from run-of-the-mine coal.

By applying radioactive isotopes and radiation emitted by radioactive isotopes in the control and automation of industrial processes, economies amounting to several billion rubles per year will be achieved within the next few years at the cost of only a very low capital investment.

Laboratories of a number of institutes have been re-equipped so that investigations involving the use of radioactive isotopes and of penetrating radiation can be carried out at these institutes. However, developments along this line have not proceeded with sufficient speed at some institutes. The subject matter plan for 1960 provides for a considerable expansion of research pertaining to the action of nuclear radiation on solids, diverse substances, and various processes. However, the scope of research in this field does not correspond as yet to the intrinsic importance of the work in question.

The presidium confirmed the plans of work involving the application of isotopes and nuclear radiation that have been submitted by the departments for 1960. The Department of Biological Sciences is supposed to expand research on radiobiology at the Institute of Evolutionary Physiology imeni I. M. Sechenov and also at the Institute of Radiation and Physico-Chemical Biology, making provisions for further expansion of research in this field and also of research in radiation genetics. The Department of Chemical Sciences has the task of preparing measures designed to strengthen the experimental basis for radiation-chemical research at academy institutions.

The Institute of Economics will conduct work in which the economic effectiveness of the application of isotopes and nuclear radiation in the national economy will be determined. This institute will also coordinate work of this type carried out at institutions of the academies of sciences of union republics.

43. Application of Scintillation Counters for the Determination of the Density of Soils and Subsoils Under Field Conditions

"Use of Scintillation Counters in Measurements by the Gamma Method," by V. Ye. Nesterov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 461-463

Application of the gamma method of measuring the density of soils and subsoils is described. Gamma radiation emitted by Co^{60} or Cs^{137} is used in measurements of this type. Application of a scintillation counter with amplitude discrimination of pulses eliminates interference by scattered radiation.

III. EARTH SCIENCES

Uranium Prospecting

44. Screening Effect of Forests in Aerial Radiometric Prospecting for Uranium

"Some Aspects of Aerial Gamma Surveying in Wooded Areas," by G. N. Kotel'nikov and N. I. Kalyakin; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 370-372

On the basis of the work described, the absorption of gamma-radiation by forests under different conditions is calculated. The effects of the screening by forests on aerial gamma-prospecting for uranium deposits are estimated. It is stated that gamma-absorption by forests may amount to 25-60%, so that aerial gamma-prospecting for uranium deposits in wooded regions is sometimes rather uncertain, i.e., uranium deposits may not be detected.

45. Prospecting for Blind Uranium Ore Bodies on the Basis of Halos Formed the Dispersion of Accompanying Elements

"Halos of Dispersion of Elements Around Uranium Ore Bodies," by A. D. Kablukov and G. I. Vertepov; Moscow, Geologiya Rudnykh Mestorozhdeniy, No 2, Mar/Apr 60, pp 20-31.

Results are reported which were obtained in an investigation of halos formed by the dispersion of a number of elements around hydrothermal uranium ore bodies. Recommendations are made concerning the use of data of this type pertaining to soluble uranium, lead, and molybdenum for the purpose of locating blind uranium ore bodies.

Miscellaneous

Pollen Aids Soviet Geologists in Determining Age of Deposits

46. "Pollen Aids Geologists," by A. Romanov, Izvestiya
Correspondent from Frunze; Moscow, Izvestiya, 28 Jun 60,
p 3

The study of pollen and plant spores as an aid in determining the age of geological deposits is being conducted in a newly created paleontological-stratigraphic laboratory headed by A. A. Volkova.

The method is based on the finding by scientists that plant spores and pollen possess exceptionally tough shells which protect them from harm under any conditions -- sun, water, high pressures -- and enable them to lie for millions of years in the earth and still retain their original shape and structure. This discovery acquired special importance after spores were successfully separated from mineral rocks.

Soviet scientists have compiled special atlases and tables with which they can establish to which period the pollen and spores detected in rock belong. The laboratory, created only 3 months ago, has already accomplished much. Paleontologist A. Lopukhin and laboratory technician T. Nikitina have processed 42 samples of different rocks and separated spores which have lain in the earth for several millions of years. The data they have compiled have already aided in more precisely determining the age of ancient deposits.

It is claimed that the method makes it possible to conduct more purposeful prospecting for useful minerals.

IV. ELECTRONICS

Communications

47. Phase Comparison Method of Signal Detection

"Optimal Phase Methods of Signal Detection," by B. R. Levin;
Moscow, Radiotekhnika i Elektronika, No 4, Apr 60, pp 537-543

The article explains a method for detection of a noise-obscured signal by means of phase comparison of the intelligence signal. Expressions are given for the probabilities of false alarms, as well as for true detection. The article discusses the optimal phase-comparison methods of detection of two types of signals: the one that can be fully defined and the one that is fluctuating in the nature. These two types of signals represent the extreme conditions.

As was shown by V. A. Kotelnikov, for a given probability of false alarms, the fully defined signal ensures the maximum probability of correct detection at a given energy level E of the signal. For a fluctuating signal having the general nature of a white noise, the probability of correct detection is at minimum even when the signal energy is equal to E .

48. Miniature Radio Telephone

"Traveling Telephone" (unsigned article); Moscow, Ekonomicheskaya Gazeta, 2 Jul 60

A pocket-size dialing-type radio telephone called "radiophone" was designed by L. Kuprianovich. It is capable, without the help of a switchboard operator, to contact directly any of the city's automatic telephone subscribers. The device consists of a receiver and two transmitters housed in a metal box. Nickel-cadmium batteries having a service life of 80 hours without recharging serve as the power supply. The range of operation of a "radiophone" is several tens of kilometers. For this purpose, 3-4 auxiliary automatic telephone radio stations are connected to the telephone network along the route. The "radiophone" maintains a two-way communication and for this reason can be very useful on construction sites, in mines, etc. The "radiophone" could be used for programmed control of various moving mechanisms.

Components

49. Production of Super-Fine Resistor Wire

"Great Deeds of a Small Plant," by Ye. Gabuniya; Kishinev, Sovetskaya Moldaviya, 28 May 60

The "Mikroprovod" Plant, located in the city of Kishinev, manufactures a super-fine, glass-insulated wire used in precision electronic instruments. The delicate process consists in drawing a wire as fine as a spider's web out of a heavy-gauge manganin wire [Cu, Mn, Ni alloy] and coating it with a pliable glass insulation. A special "generator" is used for this operation.

The manufactured super-fine wire undergoes very rigid tests for mechanical and electrical properties. The tolerance limits for this wire are set at 0.03%. An increase in production by 25% is expected when three new "generators" are ready for operation.

A new large shop is now being constructed at the plant site. When completed, it will permit a further substantial increase in super-fine wire production.

Materials

50a. Theory on the Operation of Wave Guide Resonance Isolators

"Approximate Theory of Ferrite Resonance Isolators," by A. K. Smolyarov and A. L. Mikaelyan; Moscow, Radiotekhnika i Elektronika, Vol 5, No 5, May 60, pp 740-761

An approximate theory is proposed which explains the characteristics of operation of various ferrite isolators and their possible electrical parameters and clarifies the degree to which auxiliary dielectric layers may be used to control the parameters. The theory is applicable to very thin ferrite layers only.

The authors examine resonance phenomena in ferrite layers without dielectrics, located both in the E plane and in the H plane, and proceed to an examination of the effect of a dielectric layer. It is shown that the use of a dielectric expands the operating frequency range of the isolator by two times.

50 b. High-Temperature Phase Transformation of Barium Titanate

"High-Temperature Phase Transformation of Barium Titanate," by I. A. Trifonov, Uchenyye Zapiski Fizikomatematicheskogo Fakul'teta Rostovskogo n/D Universiteta (Scientific Notes of the Physico-Mathematics Faculty of Rostov-on-Don University), Vol 46, No 7, 1959, pp 141-159 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 1.2112)

The maxima of $\epsilon(t)$ curves (showing relationship of relative dielectric constant to temperature) of certain fused polycrystalline specimens of BaTiO_3 dropped when, after annealing, the $\epsilon(t)$ relationship assumed a course which is normal for ferroceramics. The temperature-induced change in the rate of transformation of BaTiO_3 is exponential in the interval $1,050^\circ \leq t \leq 1,250^\circ \text{C}$. The predominant influence on the rate of phase transformation in this interval is exerted by the thermal energy produced by ion vibrations. Thus, a measurement of the dependence of the rate of phase transformation on temperature in this interval can be used to determine the limit of polymorphic transformation. Successive samples were annealed at 1,100, 1,150, 1,200, and 1,250 deg cent for 3 hours in each case, and the $\epsilon(t)$ diagrams were plotted. Within a temperature interval of 20-140 deg cent, no maximum is reached, and the temperature coefficient of resistance is negative. Such an $\epsilon(t)$ relationship is inherent to the hexagonal modification of BaTiO_3 ; the maximum value of ϵ was reached after 3 hours' annealing at 1,100 deg cent, which indicates the beginning of the transition from the hexagonal modification to the ferroelectric. The maxima of $\epsilon(t)$ are clearly expressed in the case of specimens annealed at 1,150, 1,200 and 1,250 deg cent. The phase transformation of barium titanate at a rate depending on temperature confirms the nucleation theory of phase transformation developed by G. V. Kurdyumov.

51. Properties of Ceramic TiO_2 - SnO_2 Dielectrics

"Dielectric Characteristics of Ceramic Dielectrics of the System TiO_2 - SnO_2 ," by A. L. Khodakov and I. N. Belyayev, Uchenyye Zapiski Fizikomatematicheskogo Fakul'teta Rostovskogo n/D Universiteta (Scientific Notes of the Physico-Mathematics Faculty of the University of Rostov-on-Don), Vol 46, No 7, 1959, pp 83-86 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 1.2111)

The dependence of the relative dielectric constant ϵ (at 10^6 cycles per second) on the ratio of components indicates that the ϵ -value is reduced with the addition of SnO_2 , reaching a point only 1/4 that of TiO_2 alone when the ratio is 85 percent SnO_2 and 15 percent TiO_2 . The temperature coefficient of the ϵ -value correspondingly changes from minus 8.0

$\times 10^{-4}$ (100 percent TiO_2) to plus 35×10^{-4} degrees (15 percent TiO_2), reaching a value close to zero at 30 percent TiO_2 . The low loss factor ($\text{tg } \delta$) observed at high frequencies in a number of compositions containing SnO_2 suggests the promise of using these ceramics in electrical engineering.

52. Dielectric Constant of Mixed Lead Titanate and Barium Titanate Electret Materials

"Dielectric Properties of Solid Solutions of Barium Titanate and Lead Titanate," by A. L. Khodakov and M. S. Shul'man, Uchennyye Zapiski Fizikomatematicheskogo Fakul'teta Rostovskogo n/D Universiteta (Scientific Notes of the Physico-Mathematics Faculty of Rostov-on-Don University, Vol 46, No 7, 1959, pp 73-78 (from Referativnyy Zhurnal -- Elektrotehnika, No.8, 25 Apr 60, Abstract No 1.2110)

Increased content of lead titanate in the solid solution reduces the ϵ -value [relative dielectric constant] at room temperature and displaces the Curie point in the direction of higher temperatures. Thus, an addition of 10 percent lead titanate to barium titanate reduces the ϵ -value two-fold and raises the Curie point by 36 degrees, whereas the ϵ -value at the Curie point is reduced at the same time. The relative increase of ϵ at the Curie point, however, becomes greater with increased lead titanate content in the solution, which can be explained by the considerably increased intensity of the internal field as a result of the increased lead titanate content. The strong internal field, which counteracts the elastic displacement of ions and causes a reduction of the ϵ -value at room temperature, is not in a position to counteract this elastic displacement at the Curie temperature. From the dependence of ϵ on the field intensity of industrial frequencies for various compositions, it follows that, as the lead titanate content increases, the maximum ϵ value shifts toward higher intensities and the peak value of ϵ drops. The coercive field likewise increases considerably with the addition of lead titanate. The Curie-Weiss law was followed for all investigated compositions. The possibility is pointed out of using certain of the investigated compositions for the production of ceramic electrets.

53. Analogous Aspects of Thermodynamic and Ferroelectric Theories

"Dielectric Hysteresis, Free Energy Surface, and Equation of State of a Ferroelectric," by N. S. Novosil'tsev, Uchennyye Zapiski Fizikomatematicheskogo Fakul'teta Rostovskogo n/D Universiteta (Scientific Notes of the Physico-Mathematics Faculty of Rostov-on-Don University, Vol 46, No 7, 1959, pp 39-53 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 1.2108)

Analogies can be drawn between the formulas in thermodynamic theory of processes in real gases and ferroelectric materials (piezoelectric materials); in ferroelectric theory, a considerable role is played by the

corrections of the internal field and the division of polarization into two components. Corrections of the generalized force and coordinate are even introduced into the Van der Waals equation. In this sense, the Van der Waals equation is analogous to the Langevin-Weiss equation. The presence of metastable states can lead to unique irreversible processes, suggesting a hysteresis effect in ferroelectrics. The isothermal curves for a gas and a ferroelectric are similar. Between them, however, there is a considerable difference in the form and distribution of curves with respect to the origin of coordinates, the isotherms of a ferroelectric being symmetrical, while those of a gas are not. Furthermore, in the case of a gas, a positive value (volume) serves essentially as a coordinate. For a ferroelectric, the polarization coordinate P has the value of a tensor, for which both signs have a physical significance. The expression for the free energy with respect to polarization P has the form

$$F = F_0 + \alpha P^2 + \frac{\beta}{2} P^4. \quad (1)$$

The equation of state is written

$$\frac{\partial F}{\partial P} = E = 2\alpha P + 2\beta P^3. \quad (2)$$

Isotherms expressed by curve(2) have all the peculiarities which result from an analogy between a real gas and a ferroelectric. The value

$$P_0 = \sqrt{\frac{-\alpha}{\beta}}$$

corresponds to the minimum free energy. This value P_0 is equal to the residual polarization by a hysteresis loop. In the analysis of an oscillatory circuit with a ferroelectric capacitor, it is important to take into account the fact that the integral curve of a steady forced process in the phase plane in a dissipative system coincides with one of the integral curves in a set of the corresponding conservative system. The work of the external force compensates losses. Thus, to obtain this unique curve of the forced process, it is possible to use a graphic method based on the diagram of the potential function and ordinarily used in the theory of oscillations to construct a set of integral curves for the conservative system. The role of potential function may be played by the thermodynamic curve which shows the dependence of the free energy on the generalized coordinate P . In view of the peculiarity of the system with hysteresis, the motion of imaginary points on the curve can be considered from one direction only. The diagram on the upper phase half-plane and the one on the lower half-plane are constructed separately. The addition of curves to the upper and lower half-planes is automatic. Although, from the thermodynamic point of view, the free energy is identical with the electrostatic potential energy of the capacitor, it

is not possible to use the graphic of such a potential function directly for the construction of the integral curves. A calculation of the stability of the state of equilibrium shows that a correction must be made in the thermodynamic curves before the processes with a finite velocity which occur in an oscillatory circuit can be described.

54. Electrical Conductivity of Barium Titanate

"On the Mechanism of Electrical Conductivity of Polycrystalline Barium Titanate," by O. I. Prokopalo and I. P. Vyrodov, Uchenyye Zapiski Fizikomatematicheskogo Fakul'teta Rostovskogo n/D Universiteta (Scientific Notes of the Physico-Mathematics Faculty of Rostov-on-Don University), Vol 46, No 7, 1959, pp 33-38 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No. 1. 2107)

To separate the charging current from the total current, the latter must be maintained constant, which requires the application of a voltage to the specimen at room temperature for an extended period. Measurements show that there is no breakdown in the $\ln \sigma (1/T)$ curve for the temperature range of 40-350 degrees centigrade, thus the same particles act as current carriers throughout the entire temperature range. The question of the type of particles which carry the charge is answered to a considerable degree by the determination of the influence of the transverse magnetic field on the current. When the magnetic field which is perpendicular to the electrical field is reversed, the current decreases uniformly throughout the specimen (within the limits of the measurement error). During the application of the magnetic field, the drop of current is not instantaneous, but extends over a certain interval of time, which is reduced with increased temperature. Increased magnetic field intensity and temperature are accompanied by increased current variation. The presence of a galvanomagnetic effect confirms the fact that the electrical conductivity of BaTiO_3 is electronic in nature.

55. Artificial Mica Consisting of Thin Glass Films

"A Competitor of Mica," by Ye. Loktionov; Moscow, Ekonomicheskaya Gazeta, No 16 (688), 18 Jun 60, p 4

At the Chair of Glass Technology, Moscow Chemico-Technological institute imeni Mendeleev, a mica substitute consisting of very thin glass films has been developed. Thin glass has a greater mechanical strength than thick glass. If the thickness of sheet glass is reduced from 8 mm to 30 microns, the transverse (bending) strength of the glass under a

steady load increases by a factor close to 9. There is a particularly great increase of strength when the thickness of the glass becomes less than 100 microns. Many problems had to be solved in connection with the development of production processes for ultrathin glass films. However, the difficulties involved in the production of glass film of this type have been overcome.

"Glass mica" consisting of glass films is not inferior to natural mica insofar as its properties are concerned. On the contrary, this mica substitute has a number of advantages. By changing the composition of the glass, one can manufacture at will products with the desired dielectric characteristics, whereas those of natural mica cannot be changed.

Glass mica is distinguished by a high degree of light transmission, adequate flexibility, and excellent mechanical characteristics. It is an excellent material for electrical insulation products, flexible insulators, and condensers.

The glass films used for the production of glass mica can also be applied to advantage in the production of glass-reinforced plastics. Glass films are superior to glass fibers in so far as their capacity for increasing the mechanical strength of plastics is concerned. Although glass fibers have a high tensile strength, this tensile strength cannot be properly utilized in the production of glass-reinforced plastics because the fibers cannot be arranged uniformly and densely in such a manner that every fiber is subjected to the same load. This can be much more easily achieved by using glass film. By using glass film, strong isotropic plastics can be produced. Furthermore, application of glass film rather than glass fibers facilitates mechanization and automation of reinforced plastics production.

56. Electrical Characteristics of Chromium Disilicide

"Concerning the Region of Homogeneity of Chromium Disilicide and the Electrical Properties of This Compound," by V. P. Trusova, V. S. Kutsev, and B. F. Ormont, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, May 60, pp 1119-1122

Compounds of silicon with metals of transitional groups exhibit a high resistance to oxidation on being heated in the air. Furthermore, a number of compounds of this type exhibit high values of thermal electromotive force (TEMF) factors, which is of importance from the standpoint of the direct transformation of heat energy into electric power. After orientational research on the electrical properties of silicides had been conducted to establish possibilities of using elements in the long period of the periodic system from titanium to nickel, it was decided that investigation of chromium disilicide would be of the greatest

advantage. Products ranging in composition from CrSi to $\text{CrSi}_{2.5}$ were subjected to investigation by chemical methods and by precision X-ray diffraction analysis. It was established in the work in question that chromium disilicide is a phase of varying composition with a rather extensive region of homogeneity which extends at least from $\text{CrSi}_{1.99}$ to $\text{CrSi}_{2.29}$. The TEMF factor was measured at room temperature within this range of homogeneity. The dependence of the conductivity on the temperature was determined for products of the compositions $\text{CrSi}_{1.99}$ and $\text{CrSi}_{2.29}$. It was found that within the range of homogeneity mentioned, the TEMF factors vary at room temperature from 90 microvolts per degree to 110 microvolts per degree, depending on the composition. Notwithstanding the different composition of the silicides $\text{CrSi}_{1.99}$ and $\text{CrSi}_{2.29}$, the dependence of relative electrical conductivity on temperature is the same for both of them. Data published in the literature refer to a substance of the formula CrSi_2 , but there is no experimental proof to the effect that the work was actually carried out on a well-defined compound of this composition.

57. Absolute Spectral Sensitivity of Photocells

"The Absolute Spectral Sensitivity of Photocells," by M. N. Smolkin; Minsk, Inzhenerno-Fizicheskii Zhurnal, No 6, Jun 60, pp 104-106

The paper describes a method for and results of measurement of the absolute spectral sensitivity of selenium photoelectric cells, photoelectric cells with cathodes of pure metal (Zn, Cd, Mg), and cells with antimony-lithium, multialkali, and antimony-cesium photocathodes.

58. Material of 1958 Moscow Conference on Physics of Dielectrics

Izvestiya Akademii Nauk, Seriya Fizicheskaya, Moscow, Vol 24, No 1, Jan 60; No 2, Feb 60

The two cited issues of the source are devoted to materials of the Second All-Union Conference on Physics of Dielectrics, held in Moscow 20-27 November 1958. Issue No 1 features reports translated from English (C. F. Smyth, Princeton; R. H. Cole, Brown University), from French (M. Magat and C. Brot), and from German (K. W. Boer, F. Obenaus, East Germany). Other reports dealing with solid state physics include:

"Dielectric Permittivity of Liquid Dielectrics in Strong Electric Fields," by A. Piekara, Physics Institute of the Polish Academy of Sciences, pp 19-24

A review is presented of results of the study of the effect of dielectric saturation with respect to a lowering of the dielectric permittivity of the liquid. The general theory developed by A. D. Buckingham (J. Chem

Phys. 25, 428 (1956) and the author (Acta phys. polon., 17, 209 (1958) makes allowance for molecular deformation in the external electric field. The application of this theory to delayed rotation of separate groups in molecules will permit a quantitative comparison with experimental data.

"Effect of Autoelectron Emission on the Strong Field Distribution in Solid Bodies," by E. I. Adirovich, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 49-57

The lecturer disputes a point made by an East German, K. W. Boeer, who reported at this conference on a new optical method for studying strong electric fields in dielectrics and semiconductors. (pp 36, 43)?

"Currents in Alkali Halide Crystals Produced by Electron Emission from a Cathode in Strong Electric Fields." Ye. A. Konorova, pp 58-65

Currents in dielectrics were studied experimentally in strong electric fields with respect to the dependence on the duration of applied voltage and temperature.

"Relation of Current in KBr Single Crystals to Temperature and Voltage in Predischage Fields," by Ye. A. Afanas'yeva, V. S. Vinogradov, and Ye. A. Konorova, pp 66-74

Explanations of experimental data are attempted on the basis of the suggested crystal model and the assumption of autoelectric emission.

"Laws of Pulsed Breakdown of Solid Dielectrics," by A. A. Vorob'yev and G. A. Vorob'yev, Tomsk Polytechnical Institute, pp 75-83

The following laws are established for pulsed breakdown of solid dielectrics: In thick solid dielectrics, the effect of polarity is revealed; the discharge voltage is higher at negative polarity than at positive.

"Peculiarities of Motion of Current Carriers in Polar Crystals," by Yu. I. Gorkun and K. B. Tolpygo, Physics Institute, Academy of Sciences of the Ukrainian SSR, pp 94-100

The motion of fast polarons is analyzed for explaining phenomena of electric breakdown, autoelectric emission, thermal emission and photo- and secondary emission with relation to resonance of the natural frequency

of the electric field of the moving charge. It was found that, with increasing velocity, the radius of the polaron first decreases and increases thereafter.

"A New Form of a Polar Model of a Crystal," by A. Ye. Glauberman, pp 101-103

The polar model offers some advantages in facilitating the separation of a part of the Hamiltonian, expressing elementary excitations. The method of Shubin-Vonsovskiy is applied for a theoretical analysis of metals, semiconductors, and dielectrics. A special method of transition to the Hamiltonian by canonical transformation in this model is presented with allowance of background peculiarities.

"Some Electroluminescent Properties of Zinc Oxide With Admixture of Bismuth Oxide," by E. G. Petsold, pp 104-107

Some electroluminescent properties of a mixture of an electron semiconductor (zinc oxide) with a hole semiconductor (bismuth oxide) are studied during the passing of a direct current through the sample. Near the point electrodes, a yellow or blue glow was observed, depending on concentration of admixture and treatment of samples.

Issue No 2 includes the following reports:

"The Possibility of Thermal Polarization of Electrons in Zinc Sulfide Crystal Phosphors," by F. I. Vergunas and P. Ye. Ramazanov, Gor'kiy Physico-Technical Research Institute at the Gor'kiy State University, pp 214-219

In the case of fine crystalline powders (crystal phosphors are available only in this state), it is difficult to determine free or localized electrons responsible for the dielectric photo effect. Thermal ratios at various frequencies of the dielectric photo effect were measured in testing ZnS-Cu, Fe. The results showed temperature maxima, not only for dielectric losses, but also for capacitance, suggesting an electron thermal polarization.

"Dielectric and Optical Properties of Some Zinc Sulfides," by E. V. Stauer and V. P. Izotov, Dnepropetrovsk State University, pp 224-228

The relation of the complex dielectric permeability of some electroluminescent and nonelectroluminescent zinc sulfides to the voltage and frequency of the applied field and to temperature and surface treatment was

studied. A considerable increase of the real and imaginary components of dielectric permeability was observed at low frequencies, as well as at rising temperatures, in all zinc sulfide phosphors.

"The Nature of Stimulated Luminescence of KCl Crystals,"
N. P. Kalabukhov, Tbilisi State University, Kiév Poly-
technic Institute, pp 229-231

The thermal luminescence of colored crystals was studied with special equipment which automatically records the curves on photographic paper. It may be concluded from the obtained data that luminescence is due to the dissociation of M-centers which are formed at 70° from F-centers by the association of the latter with two vacancies.

"Effect of Voltage of the Electric Field on the Photo-
conductivity of Liquid Organic Systems," by P. K. Mitskevich
and V. G. Bobyl, Physics Chair, Dnepropetrovsk Engineering
Construction Institute, pp 232-237

The tested organic liquids are used in scintillation counters bubble chambers, and other indicators of radiation. Experimental results exhibited a linear relation of current density to electric field strength, indicating no dependence of dark and photo conductivities on the electric field voltage.

"Studies of Photoconductivity of Ether Solutions," by Yu.
A. Kopylov, pp 237-241

Results of studies of haloid derivatives of some hydrocarbons and their solutions in diethyl ether should regularities analogous to solid semiconductors. Their relaxation processes follow exponential curves. Maximum photoconductivity occurs at the long-wave limit of absorption. The dependence of photocurrent on field voltage and on irradiation intensity is linear.

Wave Propagation

59. Effect of Reflector Imperfection on Antenna Directivity

"Investigation of the Effect of Casual Imperfections on the
Electrical Characteristics of Highly Directional Mirror Antennas
with a Reflector of Nonuniform Section," by B. V. Braude, N. A.
Yesepkina, N. L. Kaydanovskiy, and S. E. Khaykin, Moscow,
Radiotekhnika i Elektronika, No 4, Apr 60, pp 584-596

The understanding of the effect of casual imperfections generally occurring in the manufacture of large reflectors is of decisive importance in design of antennas having an extremely high directivity.

At the present state of attainable relative precision, of the order of 10^{-4} , in manufacturing metal parts, the maximum possible size of the mirror would be about 1,000 wave lengths and would have a width of radiation pattern of about 4 angular minutes, provided the absolute precision of manufacturing is kept within one tenth of the operating wave length.

Antennas with segmented reflector permit achievement of high directivity because the casual imperfections in such antennas are due primarily to the geodetic setting of each element, which can be controlled with an accuracy of the order of 10^{-6} . This was confirmed by the experience at the Main Astronomical Observatory of the Academy of Sciences USSR. Here, the radio telescope with an aperture of 4,000 wave lengths permits a radiation-pattern directivity of one angular minute when operating with a 3-cm wave, despite the fact that the antenna has a relatively weak foundation.

It was shown that a reflector built with mechanically disconnected segments will permit an effective area far in excess (as many as 50 times) of that attainable with a paraboloidal reflector.

60. Sensitivity of Infrared Detectors

"Sensitivity Threshold Limit of Thermal Radiation," by A. A. Krasovskiy and V. N. Zuykov, Moscow, Radiotekhnika i Elektronika, No 4, Apr 60, pp 544-550

Expressions for the threshold limits of sensitivity of thermal-radiation (infrared) receivers were derived on the basis of Einstein's formula defining fluctuation of radiation energy. For convenience of analysis, the limits of wave length and the brightness temperature are divided into two ranges.

The conventional formulas for estimating the sensitivity threshold are applicable to the first range, while for the second range, i.e., the range of short waves and low temperatures, the formulas presented in this article are applicable.

A series of formulas is derived for finding the limiting sensitivity for finding the direction of a very small source of thermal radiation. A similar series of formulas is derived for estimating the sensitivity threshold limit in case of monochromatic radiation.

61. Wave Scattering on a Periodically Irregular Surface

"Experimental Investigation of Electromagnetic Wave Scattering on a Periodically Irregular Surface," by V. I. Aksenov; Moscow, Radiotekhnika i Elektronika, No 5, May 60, pp 782-795

Experimental investigations of scattering of 7.95-mm-long electromagnetic waves on metallic and semiconductor surfaces of sinusoidal and saw-tooth profiles were carried out by the author in some detail. The spacing between the periodic irregularities of the scattering surfaces was 1.5 cm, while the height of corrugations was from 0.15 to 0.30 cm.

The transmitting and receiving horns of the laboratory apparatus were mounted on a semicircle of about 60 cm radius with the examined scattering surface placed at the center. A klystron was used as a source of high-frequency oscillations.

The experimental results agreed well with the theoretical calculations obtained on the basis of the theories of L. M. Brekhovskikh, Yu. P. Lysanov, and W. Meecham. The experiment revealed that the amplitude of scattered waves on metallic, periodically irregular surfaces depends on polarization of the incident wave. The experiment also confirmed that for the case of surfaces with small angle of inclination of irregularities, the ratio of absolute value of the wave amplitude as scattered from a surface with finite conductivity to that of a wave scattered from an ideally conducting surface can be readily calculated with the aid of a rather simple formula utilizing the coefficient of reflection from a plane surface.

The author thanks L. A. Zhekulin and L. S. Frumkin for their valuable assistance.

V. ENGINEERING

Atomic Power Engineering

62. Potential Distribution in Vicinity of Edges of DC Pump

"Analytical Calculation of the Distribution of Potential in the Edge Zone of a Direct-Current Pump," by Yu. Birzvalks, Institute of Physics, Academy of Sciences Latvian SSR; Riga, Izvestiya Akademii Nauk Latviyskoy SSR, No 12, Dec 59, pp 49-58

One of the most difficult problems in the theory of electromagnetic pumps is that of various edge effects. In direct-current pumps, the so-called longitudinal edge effect, which causes a spreading of the operating current beyond the zone of action of the magnetic field of the pump, is of very great practical importance. A. H. Barnes (Nucleonics, II, Jan 53) and L. R. Blake (Proceedings of the IEE, Vol 104, No 13, 1957) considered such a longitudinal effect. The Institute of Physics of the Academy of Sciences Latvian SSR has devised a simplified method of calculating such pumps; an analytical solution of the problem of the distribution of potential in the channel of a dc-pump, without accounting for the influence of the back electromotive force, has been given by K. K. Tabaks (Uchennyye Zapiski Latviyskogo Gosudarstvennogo Universita [Scientific Notes of the Latvian State University], Vol 21, 1958); a method of modeling the processes in a dc-pump, with the influence of the back-emf taken into account, has been published by L. V. Nitsetsiy (Voprosy Magnitnoy Gidrodinamiki i Dinamiki Plazmy [Problems of Magnetohydrodynamics and the Dynamics of Plasma], Riga, 1959).

This article gives a solution of the problem of the distribution of potential in the edge zone of a dc-pump, with the influence of the back-emf taken into account, assuming the following simplifying conditions:

1. The problem is two-dimensional, and an idealized form of the diffusor is considered in place of the real form.
2. The walls of the channel are nonconducting.
3. The magnetic induction depends only on a single coordinate.
4. The return effect by the spreading current on the magnetic field is neglected, and the return effect of the operating current is compensated by the return conduction in the gap.
5. The flow of liquid metal in the pump is turbulent, and the velocity of flow is constant across the entire cross section of the channel.
6. The length of the pump in one axial direction is infinite.

Electrical Engineering

63. New Series of Autotransformers

"New Series of Autotransformers," by A. G. Krayz, Opyt Raboty Promyshlennosti Sovnarkhoza (Moskovskiy Gorodskoy Ekonomicheskoy Administrativnyy Rayon) [Operating Experience of Sovnarkhoz Industry (Moscow City Economic Administrative Region)], No.6, 1958, pp 59-66 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 3.5340)

In place of the 3-winding, 220-kv transformers with split high and medium-voltage windings, the Moscow Transformer Plant has devised a new series of 3-winding autotransformers for 220 kilovolts: one-phase step-downs, one-phase step-ups, and 3-phase step-downs. The first group of this series was released in 1957. The series includes 40-, 60-, 80, and 120-Mva one-phase autotransformers and 30-, 60-, 90-, and 120-Mva 3-phase autotransformers. The rated (no-load) voltages are: 220 plus-minus 2 x 2.5% (121) kv for step-downs and 242 plus-minus 2 x 2.5% (121) kv for step-ups on the high-voltage side and 6.6, 11 or 38.5 kv on the low-voltage side. Complete ratings are given in tables. They are controlled within plus-minus 2 x 2.5% without loading; a booster transformer is used for control within plus-minus 10-12 percent under load.

64. Lyapunov Theory of Stability and Power Engineering Systems

"Brief Characterization of the Theory of Stability of Lyapunov and the Problems of Stability in Power Systems," by L. V. Tsukernik, Trudy Instituta Elektrotehniki AN USSR (Works of the Institute of Electrical Engineering, Academy of Sciences Ukrainian SSR), No 16, 1959, pp 5-20 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 2.6254)

Following a brief presentation of the Lyapunov theory of stability, a historical survey is given of the development of the problem of AC electric power systems. The theory of stability in electrical engineering is connected with the theory of automatic control because of the great importance of modern synchronous automatic control devices. The development of the theory of stability in electric power systems on the basis of the Lyapunov equations of the first approximation has afforded the possibility of eliminating a number of inaccurate conclusions from the elementary theory of synchronous machines, thereby affording the possibility of developing a method of investigating the stability of nonlinear systems. The problem of dynamic transition has recently been solved by direct Lyapunov methods. The development of the theory of stability of complex power systems has

led to a scientific substantiation of conditions of applicability of so-called practical criteria of stability, as well as to the emergence of power-engineering stability criteria for complex power systems. The development of mathematics as applied to stability theory has afforded the possibility of obtaining, in matrix form, the algorithms required for computing the coefficient of the characteristic equation and algebraic stability criteria by means of digital computers. The study of simulated stability conditions led to the creation of regulators for powerful excitations, installed for the first time in the Volga Hydroelectric Power Station imeni Lenin. The complication of the problems of investigating both "microstability" and "macrostability" led to the wide usage of analog and digital devices together with experimentation in electric power systems.

65. 1.5-Billion-Volt Impulse Generator (unsigned item); Moscow, Nedelya, 12-18 Jun 60

A photograph of an outdoor impulse generator is shown with the following caption:

"An artificial lightning of 1.5 billion volts will flash between these balls in a few seconds. This unusual high-voltage impulse generator was built at the Electric Power Laboratory of the Academy of Sciences Kirgiz SSR, where the problem of electric power transmission under conditions existing in high mountains is now being solved.

66. Extra-Long DC Electric Transmission Lines

"Long Electric Transmission Lines," by M. Kostenko, L. Neyman, A. Nekrasov, A. Lebedev, A. Posse, and S. Rokotyan; Moscow, Ekonomicheskaya Gazeta, 14 Jun 60

CPYRGHT The article has the following passages:

"More than 200,000 km of high-voltage electric transmission lines will be built during the Seven-Year Plan. Of great importance will be the 220- 330- and 500-kv lines; they will comprise the main framework of individual power systems which will merge later and, thus, become the links of the Unified Power System of the Soviet Union.

"The economic advantages of dc current can be seen from the following example: a 1,400-kv, 2,400-km dc electric power transmission line with power transmitting capacity of 4.8 million kw, as the case might be for power transmission from the thermal and hydroelectric stations of central Siberia to the industrial regions of the Urals and Novosibirskaya and Omskskaya oblasts, would afford a 40% saving in capital investment as compared to an equivalent 700-kv ac transmission line. In addition, the annual operating expenses would be lowered by one third; the annual power losses would be reduced by 600 million kwh.

"Thus, the only correct solution of the problem of transmitting large volumes of electric power at great distances is the utilization of superhigh-voltage dc current."

67. Pneumatic Transmission Makes Electric Power Production by Windmill Feasible

"Regarding a New Scheme for an Anemoelectric Station With Pneumatic Transmission of Power," by G. Kh. Sabinin, Voprosy Vetroenergii (Problems of Anemopower), Moscow, Academy of Sciences USSR, 1959, pp 118-127 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 2.6172)

An analysis of the operation of the wind wheel of the "Andro" aggregate, the principle of which is analogous to that of the centrifugal exhaust fan, shows that, accounting for the efficiency of the air turbine, the maximum possible efficiency of the pneumatic transmission is equal to or less than 0.51. A check calculation of a 100-kilowatt aggregate shows the reason for the low efficiency to be the losses during the passage of air through the blades (75 percent loss). Some reduction of losses is possible by improving the blade parameters. The new design makes possible the construction of powerful anemoelectric stations, which are limited in the usual design by complex mechanical transmissions.

68. Use of Computers for Determining Power Line Stability

"The Use of Analog Computers for the Investigation of the Statistical Stability of Electrical Transmissions Over Long Distances," by V. S. Tarasov, Yu. V. Rakitskiy, and V. A. Mushnikov, Nauchno-tekhnicheskii Informatsionnyy Byulleten'. Leningradskiy Politekhnikheskiy Institut (Scientific-Technical Information Bulletin. Leningrad Polytechnic Institute), No 1, 1959, pp 77-89 (from Referativnyy Zhurnal -- Elektrotehnika, No 8, 25 Apr 60, Abstract No 2.6255)

The solution of the problem of electrical transmission with intermediate compensation is described by a system of nine linearized differential equations. For concrete cases, the stability or instability, the nature of instability, the limits of stable regions, and the nature of the transient process are determined. The errors in calculation lie within one percent. The primary sources of error in the solutions are also discussed.

VI. MATHEMATICS

69. Division of Spaces Into a Countable Number of Zero Dimensional Sets

"On the Division of Spaces Into a Countable Number of Zero Dimensional Sets," by L. A. Tumarkin, Chair of Mathematical Analysis, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 1, Jan/Feb 60, pp 25-32

The following theorems are stated and proved:

1. An n -dimensional Euclidean space can be divided into a countable number (no intersection in pairs) of zero dimensional sets in such a way that the join of each finite number of such sets remains zero dimensional.

2. Any finite dimensional metric space of dimension greater than zero with a countable basis may be divided into a countable number (no intersection in pairs) of zero dimensional sets in such a way that the join of any finite number of sets remains zero dimensional.

3. An infinite dimensional metric space having a countable basis and representing the sum of a countable number of finite dimensional sets closed in the metric space and of infinitely increasing dimension can be divided into a countable number (no intersection in pairs) of zero dimensional sets in such a way that the join of any finite number of such sets remains zero dimensional.

4. An infinite dimensional metric space having a countable basis and representing the sum of a countable number of zero dimensional sets can be divided into a countable number (no intersection in pairs) of zero dimensional sets in such a way that the join of any finite number of such sets remains zero dimensional.

70. Systems of Differential Equations Studied

"Concerning General Systems of Differential Equations," by L. R. Volevich; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May 60, pp 20-23

The properties of a differential equation basically (with the exception of the so-called degenerate cases) are determined by its principal part, i.e., by the members of the equation containing the largest derivatives; in an investigation of systems of equations, it is also sometimes necessary to exclude the principal terms of the system. However, in the case of a system, the exclusion of the principal terms of the system is

not as well defined as in the case of one equation, and it is possible by various means to determine "the principal part" of the system. It is pointed out that methods, which are by name different, for excluding the principal part of a system correspond to different definitions of equations being elliptic (I. G. Petrovskiy, Matem. sborn., Vol 5, No 3, 1939; A. Douglis and L. Nirenberg, Comm. on Pure and Appl. Math., Vol 8, No 503, 1955) and to different definitions of equations being hyperbolic (I. G. Petrovskiy, Matem. sborn., Vol 2, No 814, 1937, and J. Leray, Lectures on Hyperbolic Equations With Variable Coefficients, Princeton, 1952). The first portion of this work gives a method of constructing the principal part of the system and gives the definition of the characteristic form for the system of equations. By the employment of the properties of the characteristic form, an effective definition for elliptic equations is given, which is equivalent to the definition of Douglis and Nirenberg.

General systems of ordinary equations are considered especially, and a method is indicated for reducing them to systems in which the principal part has a diagonal matrix. This reduction affords the possibility of determining the number of arbitrary constants in the general solution of a system of ordinary equations with variable coefficients and of constructing the fundamental system of solutions for this system.

71. Differential Equations With a Discontinuous Right Side

"Differential Equations Having a Discontinuous Right Side,"
by A. F. Filippov; Moscow, Matematicheskii Sbornik, Vol
51 (93), No 1, May 60, pp 99-128

Up to the present time, the study of ordinary differential equations having a discontinuous right side has taken the following two trends:

1. The first direction is employed for solving differential equations (and systems) with a discontinuous right side of a very general form. Theorems have been proved concerning the existence of a solution, and the fundamental properties of these solutions have been investigated. These results, coupled with a generalized concept of a solution for a differential equation, also envelop that case in which the right side of the differential equation is continuous at all points of the considered region (C. Caratheodory, Vorlesungen ueber reelle Funktionen, [Lectures Concerning Real Functions], Leipzig, 1927; A. Rosenthal, "Concerning the Existence of Solutions of Systems of Ordinary Differential Equations," Sitzungsberichte Heidelberger Akademie, Mathematisch-Naturwissenschaftliche Klasse, [Conference Reports, Heidelberg Academy, Mathematics-Natural Sciences Class], Vol. 19, Proceedings 1929, pp 3-10; Ye. Ye. Viktorovskiy, "Concerning One Generalization of the Concept of Integral Curves for a Discontinuous Field of Directions," Matematicheskii Sbornik, Vol 34 (76), 1954, pp 213-248; and J. Kunzweil, "Generalized Ordinary Differential Equations and Continuous Dependence on a Parameter," Czechoslovakian Matematicheskii zhurnal, Vol 7, No 3, 1957, pp 418-449).

2. The second direction for differential equations (and systems) with a piece-wise continuous right side is discussed in a series of works (see, for example, Yu. K. Solntsev, "Concerning the Stability According to Lyapunov of Equilibrium Conditions of a System of Two Differential Equations in the Case of Discontinuous Right Sides," Uchenyye Zapiski MGU, Matematika, Vol 4, No 148, 1951, pp 144-180; L. S. Pontryagin and V. G. Boltyanskiy, "Concerning the Stability of an Equilibrium Condition for a 'Rayleigh' System of Ordinary Differential Equations," Trudy Tret'yego Matem. S'yezda [Works of the Third Mathematics Congress], Vol 1, 1956, pp 217-218; and M. A. Ayzerman and F. Ya. Gantmakher, "Stability According to Linear Approximation of a Periodic Solution of a System of Differential Equations With Discontinuous Right Sides," Prikladnaya Matematika i Mekhanika, Vol 21, No 5, 1957, pp 659-669). The behavior of solutions from the qualitative side was investigated. The solutions of such equations are composed of pieces, each of which passes into the region where the right side of the equation is continuous and sometimes also of pieces lying on the boundary of two regions of continuity of the right side. The application of such a method causes difficulties in those cases in which, in the course of a finite interval of time, the solution hits the line (or surface) of discontinuity of the right side of the differential equation an infinite number of times. Such a case may be represented, for example, as the equation considered by R. Reissig ("Constrained Oscillations With Viscous and Dry Friction," Mathematische Nachrichten, Vol 11, No 6, 1954, pp 345-384) for constrained oscillations in the simultaneous presence of two kinds of friction, viscous and dry. The equation has the form:

$$x'' + bx' + k \operatorname{sgn} x' + cx = e(t)$$

where b , k , c are positive constants and $e(t)$ is a continuous periodic function. In similar cases, it is impossible to prove, by general methods, theorems concerning the existence of a solution, its duration, its uniqueness, and the continuous dependence of the solution on the initial conditions, as well as in those cases which remain uninvestigated up to the present time.

In the present work, a new definition is given for a solution of a system of differential equations having a discontinuous right side, and the properties of such solutions are studied (existence, duration, uniqueness, and continuous dependence of the solution on the initial conditions and the right side). Within several bounds, the possibility is substantiated for the application of fundamental methods of the qualitative theory of differential equations to such an equation. The obtained results are utilized for the investigation of systems of differential equations with a piece-wise continuous right side. Such an approach makes it possible to overcome the difficulties appearing in cases in which the solution may not be composed of a finite number of smooth pieces and to obtain a series of new results. In particular, theorems of existence, duration, uniqueness, and continuous dependence of the solution for $t > t_0$ on the initial

conditions for $t = t_0$ were proved for systems of equations with a piecewise continuous right side for sufficiently wide hypotheses. For equations of nonlinear oscillations in the case in which the friction is a discontinuous function of velocity, the possibility also exists of applying such methods in the investigation of periodic solutions, such as for analogous equations with continuous friction.

72. Nonlinear Differential Equations

"Concerning the Cauchy Problem on the Whole for Several Nonlinear Differential Equations of the First Order," by S. N. Kruzhkov, Moscow State University imeni M. V. Lomonosova; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 36-39

The Cauchy problem is considered for the equation

$$u_t + \varphi(u_x) = 0, \varphi''(v) \geq a > 0, \varphi(0) = \varphi'(0) = 0 \quad (1)$$

in the half plane $t \geq 0$ with the initial condition

$$u(0, x) = u_0(x),$$

where $u_0(x)$ is an arbitrary bounded function.

The author defines a general solution of problem (1), (2), proves its existence, uniqueness, and continuous dependence on the initial conditions, and clarifies several properties of the general solutions. One of the characteristic properties of these solutions, significantly distinguishing them from general solutions of the Cauchy problem for quasilinear equations of the first order, is that they are continuous in the half plane $t \geq 0$ for any initial conditions (see O. A. Oleynik, Uspekhi matematicheskikh nauk, Vol 12, No 3 (75), 1957, and O. A. Oleynik, Trudy Moskovskogo matematicheskogo obshchestva No 5, 1956).

73. Groups of a Linear Differential Equation of the Second Order

"Concerning the Finding of a Group of a Linear Differential Equation of the Second Order," by L. V. Ovsyannikov, Institute of Hydrodynamics, Siberian Division of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 44-47

A report is given of several results connected with the problems of finding groups of transformations observing a given linear differential equation with partial derivatives of the second order for any number n of independent variables ($n \geq 1$). After the defining equations of the

infinitesimal transformations are derived, the invariant form of these equations is established, which contains only the vector and invariant of that space associated with the given equation of the Riemannian space. The final solution of the problem is not obtained; only several general facts are derived in the present paper.

It is noted that the first initial general presentation of these problems involves the problems of group classification of a system of differential equations and was made by S. Lie (Archiv fuer Mathematik, Vol 6, No 3, 1881). In particular, he obtained a classification of the linear equations of the second order for the case $n = 2$, valid in non-invariant form. This presentation is different from that one proposed by I. M. Gel'fand which appeared in DAN, Vol 70, No 1, 1950, where the unknown quantities are equations satisfying the given group.

74. Embedding of Affinely Connected Space With Torsion in an Affine Space

"On the Merging of an Affinely Connected Space With Torsion Into an Affine Space," by A. K. Rybnikov, Chair of Differential Geometry, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika Mekhanika, No 1, Jan/Feb 60, pp 3-15

The article considers an n -dimensional surface in an N -dimensional affine space. At each point, M of this surface is connected an n -dimensional plane S running through point M , and an $(N-n)$ -dimensional plane Σ which has only one point M in common with S .

On the basis of the calculations, the following theorem is established:

"Any n -dimensional affinely connected space with torsion is embedded in an N -dimensional affine space, if $N \geq \frac{n^2 + 3n - 2}{2}$, when n is odd, and if $N \geq \frac{n^2 + 4n - 4}{2}$, if n is even. It makes no difference how the embedding takes place; $(N - \frac{n^2 + 3n - 2}{2})(2n + 1) - \frac{3n^2 - n - 2}{2}$ is determined by arbitrary functions of n arguments, if n is odd, and $(N - \frac{n^2 + 4n - 4}{2})(2n + 1) + \frac{5n^2 - 4n - 4}{2}$ is determined by arbitrary functions of n arguments, if n is even."

75. Uniqueness Theorems for Surfaces

"Uniqueness Theorems for Surfaces in the Large," by A. D. Aleksandrov; Leningrad, Vestnik Leningradskogo Universiteta Seriya Matematiki, Mekhaniki i Astronomii, No 7, Mar 60, pp 5-13

Let $H(x, y, z)$ be a function defined in the whole space except for the point $(0, 0, 0)$ with the following properties: (1) For any $\lambda > 0$, $H(\lambda x, \lambda y, \lambda z) = \lambda H(x, y, z)$, (2) H is of class C^1 , and (3) H is twice differentiable either everywhere or almost everywhere and, in this case, has generalized second derivatives summable with squares. The following theorems were then proved:

Theorem 1. At each point, with the exception of a set of measure zero, let either $d^2H = 0$, or let d^2H have eigenvalues R_1, R_2 , of opposite sign with a bounded ratio, that is, such that there exists a constant A at all such points so that

$$A > \left| \frac{R_1}{R_2} \right| > \frac{1}{A}, \text{ then } H = ax + by + cz.$$

Theorem 2. Let S be an arbitrary closed convex surface. Assume S is deformed because of such a displacement of its supporting planes that the change H of its supporting function is subject to the above conditions; assume that the changes $\Delta R_1, \Delta R_2$ of its principal radii of curvature are such that at each point where they exist either $\Delta R_1 = \Delta R_2 = 0$ or $\Delta R_1 \Delta R_2 < 0$ and $A > \left| \frac{\Delta R_1}{\Delta R_2} \right| > \frac{1}{A}$, $A = \text{const}$, then the deformation of S reduces to a

parallel translation.

Theorem 3. Let a function H with the above properties be twice differentiable everywhere. Let at each point either $d^2H = 0$ or $R_1 \cdot R_2 < 0$ and for any fixed point X_0 and a variable point X , where $R_1 R_2 < 0$,

$$\left(\left| \frac{R_1}{R_2} \right| + \left| \frac{R_2}{R_1} \right| \right) r(XX_0) \rightarrow 0 \text{ provided the distance } r(XX_0) \rightarrow 0, \text{ then } H =$$

$ax + by + cz$. To this theorem there corresponds a uniqueness theorem for convex surfaces with twice differentiable supporting functions similarly as theorem 2 corresponds to theorem 1.

76. Sturm-Liouville's Differential Singular Operator Investigated

"Formulas for Traces in the Case of Sturm-Liouville's Differential Singular Operator," by V. S. Buslayev and L. D. Faddeyev, Leningrad State University imeni A. A. Zhdanov; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 13-16

I. M. Gel'fand, B. M. Levitan, and L. A. Dikiy obtained identities for the eigenvalues of the regular Sturm-Liouville operator (Uspekhi Matematicheskikh Nauk, Vol 13, No 3, 1958, pp 111). The identities may be interpreted as expressions for the regulation of the spectral traces of whole number degrees of the operator immediately in terms of the operator. Such a formulation permits presenting a similar problem for an operator with a continuous spectrum.

Several characteristics of the spectrum for the operator

$$L y \equiv - y'' + q(x), y, 0 \leq x < \infty, y(0) = 0$$

are expressed in the present work by relations in terms of $q(x)$. These relations are analogous to the identities for the eigen values. The method of derivation is based on study of the properties of the denominator of the resolvent. It is proved to be convenient also in the case of a regular operator.

77. Elliptical Operators Estimated

"Evaluation of the Resolvents of Singular Elliptic Operators," by A. G. Kostyuchenko, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 32-35

Estimates are given for the resolvents of one class of elliptic operators, and, with their help, theorems are established concerning the completeness of the eigen and adjoint functions of these operators.

78. Elliptical Differential Operators Estimated

"Estimates in L_2 for Solutions of Linear Elliptic and Parabolic Systems," by L. N. Slobodetskiy; Leningrad, Vestnik Leningradskogo Universiteta Seriya Matematiki, Mekhaniki i Astronomii, No 7, Mar 60, pp 28-47

The present work is a continuation of the work by the author which appeared in Doklady Akademii Nauk SSSR, Vol 123, No 5, 1958. Only the first chapter, devoted to elliptical differential operators, is presented. The second chapter, dealing with parabolical operators, will be published later.

Let $L = L(x, \frac{\partial}{\partial x})$ be an elliptical differential operator of order $2k$ defined in a finite or infinite domain Ω of the Euclidean n -dimensional space E_n . Let $R_\mu = R_\mu(x', \frac{\partial}{\partial x})$ ($\mu=1, 2, \dots, k$) be differential operators defined on the finite or infinite boundary S or the domain Ω . The chief result of the first chapter consists in establishing two-sided estimates for the function $u = u(x)$ of the Soboleff space $W_2^{(k)}(\Omega)$ ($k \geq 2k$) in the terms of Lu and $R_\mu u|_S$.

79. Particular Integrals and Convergence of Fourier Series

"Particular Integrals and the Divergence of Fourier Series," by A. I. Shmukler, Chair of the Theory of Functions, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematiki, Mekhanika, No 1, Jan/Feb 60, pp 16-24

This article presents a study of particular integrals of continuous functions in relation to the divergence of Fourier series. Theorems of Titchmarsh (Proceedings of the London Mathematics Society, No 24, 1925, pp 347-358) and Kaczmarz (Studia Mathematica, Vol 3, 1931, 189-199) regarding the convergence of certain integrals are carried over to integrals of a general type.

80. Poincare Problem for Analytic Functions Solved by New Method

"Concerning One Method for Solving the Poincare Problem for Analytic Functions," by V. S. Vinogradov, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 17-19

The following boundary value problem was solved: to find the function $f(z)$ analytic in the unit circle $|z| < 1$ which satisfies the condition

$$\operatorname{Re} \left\{ a(z) f'(z) + b(z) f(z) \right\} \Big|_{\Gamma} = c(z)$$

on its boundary Γ ; $a(z)$, $b(z)$, and $c(z)$ are functions given on Γ and satisfying the Gelder condition with index ν ($0 < \nu \leq 1$), $|a(z)| \neq 0$.

81. Nilpotent Lie Groups Investigated

"Induced Representation of Nilpotent Lie Groups," by A. A. Kirillov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 5, Oct 59, pp 886-889

The unitary representation of nilpotent groups is as yet little studied. The first general results were obtained by J. Dixmier in his works appearing in Bulletin de la Societe Mathematique de France, Vol. 85, 1957, p 325, and Annales de l'Institut Fourier, Vol 7, 1957, p 315.

In the present work, the method of induced representations is applied to the description of all irreducible unitary representations of nilpotent Lie groups. In particular, it is proved that any such representation is realized in the space of all functions with a summed square on a certain homogeneous manifold. The operators of the representation act in that space as a displacement with multiplication on the function

$$F_g f(M) = \alpha(g, M) f(Mg).$$

82. Linear Operators in a Locally Convex Space

"Concerning Many-Valued Linear Operators in a Locally Convex Space," by V. A. Shchel'nov; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, May/Jun 60, pp 75-77

Several properties of general, many-valued linear operators in locally convex separable spaces are considered.

83. Sequences of Linear Positive Operators

"Concerning the Conditions of Convergence for Sequences of Linear Positive Operators in the Space of Continuous Functions Given on Closed Surfaces," by V. I. Volkov; Moscow, Uspekhi Matematicheskikh Nauk, Vol 15, No 1 (91), Jan/Feb 60, pp 181-184

Let M be the closed and bounded set of Euclidean spaces and $L_n(f(q), p)$, $p, q \in M$ be an arbitrary sequence of linear operators given on the set of all continuous functions $f(q)$ on M .

Definition 1. A system of m , $m \geq 3$ continuous functions $f_1(p)$, $f_2(p)$, ..., $f_m(p)$ on the set M will be called a R_m - system on the set M if for each point $p_1 \in M$ ($i = 1, 2, 3$) the rank of the matrix

$$\begin{vmatrix} f_1(p_1) & f_2(p_1) & \dots & f_m(p_1) \\ f_1(p_2) & f_2(p_2) & \dots & f_m(p_2) \\ f_1(p_3) & f_2(p_3) & \dots & f_m(p_3) \end{vmatrix}$$

$$\begin{vmatrix} f_1(p_1) & f_2(p_1) & \dots & f_m(p_1) \\ f_1(p_2) & f_2(p_2) & \dots & f_m(p_2) \\ f_1(p_3) & f_2(p_3) & \dots & f_m(p_3) \end{vmatrix}$$

$$\begin{vmatrix} f_1(p_1) & f_2(p_1) & \dots & f_m(p_1) \\ f_1(p_2) & f_2(p_2) & \dots & f_m(p_2) \\ f_1(p_3) & f_2(p_3) & \dots & f_m(p_3) \end{vmatrix}$$

is equal to three.

Definition 2. A system of m continuous functions given on the set M will be called a ψ_m system on that set if for each point $p_0 \in M$ the condition

$$\psi(p, p_0) = \sum_{k=1}^m a_k f_k(p)$$

is found, such that $\psi(p_0, p_0) = 0$, $\psi(p, p_0) > 0$, if $p \neq p_0$, $p \in M$.

In a work of P. P. Korovkin ("Concerning Convergence of Linear Positive Operators in the Space of Continuous Functions," Doklady Akademii Nauk SSSR, Vol 90, No 6, 1953, pp 961-964), it is proved that the system $\{f_k(p)\}_1^m$, $m \geq 3$, belonging to the R_m system, is necessary, that the belonging of $\{f_k(p)\}_1^m$, $m \geq 3$, to the ψ_m is sufficient, and that the relation

$$L_n(f, p) \rightarrow f(p)$$

follows from the relation

$L_n(f_k, p) \rightarrow f_k(p)$. From this it follows that a ψ_m system is also an R_m system.

In a work of V. I. Volkov ("Convergence Conditions for Sequences of Linear Positive Operators in the Space of Continuous Functions of Two Variables," Uchenyye Zapiski Kalininskogo Pedagogicheskogo Instituta [Scientific Notes of the Kalinin Pedagogical Institute] Vol 26, 1958, pp 27-39, Theorem 3), it is proved that if an R_4 system is given in an open bounded region D of the 2-dimensional space, then it is a ψ_4 system in that region.

In the present work, the conditions are investigated for which

$$L_n(f(q), p) \rightarrow f(P),$$

where $f(q)$ is any continuous function, and the set M is a closed surface of the 3-dimensional space.

84. Stieltjes-type Integral Studied

"Concerning the Stieltjes-Berkilya Integral," by D. F. Protsenko, Academy of Sciences Georgian SSR, Computer Center, Tbilisi; Tbilisi, Soobtshcheniya Akademii Nauk Gruzinskoy SSR, Vol 24, No 2, Feb 60, pp 145-152

An integral of the form

$\int f(x) u(\omega) d\omega$, defined as the limit of the sum $\sum_{i=1}^n f(\xi_i) u(\omega_i) \omega_i$, was considered in the work of N. Gunter ("On Stieltjes Integrals and Their Applications to the Problems of Mathematical Physics," Trudy Fiziko-Matematicheskogo Instituta imeni V. A. Steklova, Vol 1, 1932) where ω represents the measure of a region of the R_n space; the region is called a set of the form $E + E'$ if E is an open set and E' is the set consisting of all its limit points which are not found within the set E and the Jordan measure of the set E' is equal to zero (see the work referred to above, p 4, and the work of Gunter (Integraly Stilt'yesa v matematicheskoy fizike i teorii integral'nykh uravneniy [Stieltjes Integrals in Mathematical Physics and in the Theory of Integral Equations], Leningrad, 1934, pp 271-317).

In the indicated work, those cases are considered in which $u(\omega)$. ω is an additive function of the region. Integral equations are studied having such integrals, and this theory is applied in problems of mathematical physics.

In a work of G. P. Khakhubiya ("Concerning One Generalization of the Stieltjes-Gunter Integral," Trudy Gruzinskogo Politekhnikheskogo instituta imeni S. M. Kirova, [Works of the Georgian Polytechnic Institute] No 2 (37), 1955 pp 57-78) the integral

$$\int_D \phi(\rho) \varphi(\omega) \mu(d\omega)$$

is considered as a limit of the sum

$$\sum_{k=1}^n \psi(\rho_k) \varphi(\omega_k) \mu(\omega_k)$$

and it is proven that, if the function $\psi(\rho)$ is integrated according to the function $\mu(\omega)$ ($\mu(\omega)$ positive, additive, and absolutely continuous), $\psi(\omega)$ bounded and $\psi(\omega) \mu(\omega)$ semiadditive from above, then the integral

$$\int_D \psi(\rho) \psi(\omega) \mu(d\omega) \text{ exists.}$$

In the present work, an integral of the Stieltjes type is considered with nonadditive integrant functions. The properties of this integral are studied, and theorems concerning its existence are proved, as well as theorems concerning the limit transition under the integral sign.

The notation and terms of a work by D. F. Protsenko ("Concerning the Berkilya Integral," Soobshcheniya AN GSSR [Reports of the Academy of Sciences Georgian SSR], Vol 24, No 1, 1960) are employed in the present work.

VII. MEDICINE

Biophysics

85. Harmful Effects of Ultrasound-Induced Chemical Changes in Water

"The Effect of Ultrasound-Treated Water on Certain Animal and Plant Organisms," by F. A. Gurevich, M. S. Levinson, and G. S. Komolova, Krasnoyarsk State Medical Institute and Institute of Physics, Siberian Branch of Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 4, 1 Feb 60, pp 893-894

Current literature indicates that ultrasound vibrations affect strongly the structure of the protoplasm, the metabolic processes, and the growth and development of organisms. Furthermore, ultrasound has been used for the inducement of purposeful changes in the progeny of organisms. The research described concerns the effect of ultrasound-treated water on certain organisms (*Spirogyra*, *Elodea canadensis*, *Paramecium caudatum*, *Daphnia pulex*, *Lumbricus terrestris*, etc.) which live in water.

Results of these data indicate that as a result of the ultrasound treatment, chemical changes occur in the composition of the water and are sharply reflected in the behavior and in the morphology of the experimental organisms. In many cases changes in the form of the body and in the nature of its movement take place just a few seconds or a few minutes after the ultrasound effect, and after various time intervals the organisms die. Some of these changes include the following: changes in the natural coloring, sensitivity, form and size of the body; changes in the intensity and rate of metabolic processes; and changes in the behavior of the organism.

The authors conclude that the chemical changes which occur in water subjected to the prolonged effect of ultrasound vibrations are destructive to a number of marine organisms.

Epidemiology

86. Plenum Hears Reports on Zoonoses Control

"Control of Zoonoses in the USSR" (unsigned article);
Moscow, Meditsinskiy Rabotnik, 26 Feb 60, p 4

"A plenum of the Department of Animal Husbandry of the All-Union Order of Lenin Academy of Agricultural Sciences imeni V. I. Lenin, devoted to the problem of the control of zoonoses, was participated in by a large group of graduate doctors and practicing physicians.

"The following reports were heard at the plenum: 'Veterinary-Sanitary Measures for the Prophylaxis of Zoonoses in the USSR,' by A. A. Boyko, chief of the Main Inspection on Veterinary Medicine, Ministry of Agriculture; 'Veterinary-Sanitary Measures and Means of Prophylaxis of Brucellosis,' by Ye. S. Orlov, director of the Laboratory of Brucellosis, All-Union Experimental Institute of Veterinary Medicine; and others.

"Medical representatives also participated in the meetings. Substituting for the chief of Gossaninspektsii [Gosudarstvennaya Sanitarnaya Inspektsiya, State Sanitary Inspection], Ministry of Health USSR, S. M. Smirnov devoted his report to the problem of zoonoses in the USSR. Having noted that zoonoses comprise half of all infectious diseases of humans, the reporter pointed out the need for still closer connection between public health institutions and the veterinary service, and for joint action on decreasing the incidence of and eradicating zoonoses.

"In addition, the reports of Professors N. G. Olsuf'yev (on the prophylaxis of tularemia), P. A. Vershilov (on the prophylaxis of brucellosis in human), and V. P. Pod'yapol'skaya (on measure of eradicating Taeniarhynchosis) were heard."

Hematology

87. Chinese Study Effect of Phospholipids on Blood

"That Action of Phospholipids on Tissue Cells. X. On the Human Blood," by Wang Sheng-yuan (王 聲 遠) and Ma Wen-chao (馬 文 昭), Department of Histology and Embriology, Peking Medical College; Peiping, Chieh-p'ou Hsueh-pao (Acta Anatomica Sinica), Vol 4, No 3-4, Dec 59, pp 111-118

The authors state that the tissue building effect of phospholipids was demonstrated in previous studies of their series on the "Action of Phospholipids on Tissue Cells." In those earlier investigations experimental animals were used as subjects and the results obtained provided a basis for further and more recent studies on the effect of phospholipids on human health and human blood and also on the relationship between one's state of health and blood picture. It was found that the oral administration of phospholipids extracted from soybeans was effective treatment for neurasthenia and could improve the health of normal and feeble persons as well as of those with organic disorders.

This paper presents the details of clinical studies on the effect of phospholipids on the blood picture. The following important facts reportedly were observed in 68 cases after the administration of soybean phospholipids prepared by the Peking Pharmaceutical Plant: (1) An increase in hemoglobin content averaging one gm/100 cc; (2) an increase in concentration and stainability of mitochondria and neutral-red bodies in the leukocytes; (3) a drop in the percentage of mesolymphocytes; and (4) in the peripheral blood, no apparent change in the numerical values of the morphological elements, in differential counts, or in the peroxidase reaction of leukocytes.

Immunology and Therapy

88. Therapy of Experimental Gas Gangrene Infection

"Effect of Synthomycin and Levomycetin When Used Separately or in Combination With Antigangrene Serum on Experimental Gas Gangrene Infection Induce by a Combination of Microorganisms," by S. V. Solov'yev and K. I. Matveyev (Moscow); Moscow, Eksperimental'naya Khirurgiya, Vol 5, No 2, Mar/Apr 60, p 62

"We have undertaken the study of the therapeutic effectiveness of synthomycin and levomycetin when used separately or in combination with antiperfringens serum in animals infected with *Bacillus perfringens* in

association with *Bacterium proteus vulgaris*. The experiments were carried out on albino mice and guinea pigs. The antibiotics were administered to the animals locally either at the time of infection or 2 hours later, in doses of 0.015-0.02 grams to the mice and 0.05-0.1 grams to the guinea pigs. The antiperfringens serum in quantities of 50 active units was injected into the guinea pigs. The preliminary experiments revealed that the antibiotics were effective when locally applied or repeatedly administered per os in animals infected with monocultural *Bacillus perfringens*. Synthomycin was also found to be effective when used in the therapy of animals infected with *Bacillus perfringens* in association with *Bacterium proteus vulgaris*. In the combined therapy of guinea pigs infected with the association of the two cultures, good therapeutic effects were also obtained by the application of levomycetin in reduced doses of 0.001 gram; this confirms the advisability of the combined application of levomycetin and the antigangrene serum. In addition, the experiments once more confirmed the need to study the antibacterial activity of the antibiotics in relation to wound microflora before they are applied."

89. Effect of Some Antibiotics on Immunizing Reactivity

"Effect of Synthomycin, Levomycetin, and Phthalazole on the Immunizing Reactivity of the Organism," by Ye. G. Miroshnichenko, Sb. Tr. Kurskovo Med. In-ta (Collection of Works of the Kursk Medical Institute), 1957, No 12, 241-242 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 60, Abstract No 27570)

"Rabbits (20) were inoculated three times (within a period of 3 weeks) with heat-processed Paratyphoid B vaccine. Synthomycin levomycetin, and phthalazole /phthalylsulfathiazole, Lekarstvennyye Sredstva by M. D. Mashkobskiy, Moscow, Medgiz, 1957, pp 490-491, or levomycetin in combination with phthalazole were administered to the animals 24 hours before and in the course of the immunization process. The titer of agglutinins (TA) and phagocyte activity of the leukocytes (PAL) increased in all the animals. The highest indexes were noted in the control animals (1:2,000-TA, and 49 percent -- PAL). On the seventh day after the third immunization, the TA and the PAL in the animals which were administered levomycetin were respectively 1:330 and 28 percent; in the rabbits which received phthalazole, 1:800 and 38 percent; in the animals which received levomycetin plus phthalazole, 1:1,200 and 40 percent. Soon after the administration of levomycetin and phthalazole was halted, a tendency toward restoration of the normal development of antibodies was noted when the animals were re-vaccinated."

90. New Complex Salts of Antibiotics

"Problems of the Controlled Penetration of Antibiotics Into the Lymphatic System Report II. Basic Chemical and Pharmacological Properties of Special Preparations ('Antibio-lymphins')," by J. Hoffman, P. Malek, M. Herold, J. Capkova, J. Kolc, and M. Vondracek, Casop. Lek. Cesk. (Czechoslovakia), 1959, 31, 965-967 (from Meditsinskiy Referativnyy Zhurnal, Section 3, No 4, Apr 60, Abstract No 1449, by B. M. Hemirovskaya)

"New complex salts of antibiotics of an alkaline character (that of streptomycin) with high-molecular anions have been prepared. When administered intramuscularly, these salts create in the blood a low but long-lasting concentration of antibiotics; when administered intravenously, they are slowly excreted by the organism. The acute toxicity of these salts as compared with that of streptomycin sulfate and neomycin sulfate is considerably lower."

91. New Method of Preparing Anti-Influenza Diagnosticum

"In the Laboratories of the Institutes" (unsigned article); Moscow, Meditsinskiy Rabotnik, 21 Jun 60, p 2

"A method for the mass preparation of diagnostic anti-influenza sera has been developed in the Laboratory of Immunology of the Institute of Virology imeni D. I. Ivanovskiy, Academy of Medical Sciences USSR. After absorption, immune rabbit sera contain specific antibodies to a specific influenza virus in high titers. This makes it possible to determine rapidly the type of virus isolated from a patient.

"The sera can assist physicians in learning what type of virus has caused an outbreak.

"Collections of diagnostic sera prepared by the institute are sent to all laboratories of scientific and therapeutic institutions."

92. Czechoslovak Sabin Vaccine Production Described

"With Us, Production; With Them, No Money For It," by Sandor Horvath; Bratislava, Uj Szó, 18 Jun 60, p 8

Beginning with an invidious comparison between Czechoslovak and US infantile paralysis prevention programs, the article then describes Czechoslovak production of Sabin vaccine.

The Pharmaceutical Control Institute (Gyogyszerellenorzo Intezet; Hungarian version of Czech name) of the Czechoslovak Academy of Sciences is located in the Vinohrady quarter of Prague. The Infantile Paralysis Vaccine Experimental Institute "subleases" part of Building No 3 at this site. In this institute, more than 100 employees participate in the production of vaccine. The article stresses that this does not involve mass production procedures: "each shop is a laboratory."

Dr Dimitrij Slonim, chief of the epidemiology department, described the nature of the disease to the author of the article. The article describes the advantages of the Sabin over the Salk vaccine and notes that inoculation in Czechoslovakia, using the Sabin method, is against three types of paralytic virus.

The laboratory is protected against contamination by foreign bacilli by ultraviolet light. The article sketches the production processes, noting the difficulty of preparing live tissue culture mediums from monkey kidneys. Dr Ivan Mares, chief of the live tissue department, described the work of his laboratory.

Pharmacology and Toxicology

93. Effect of Ganglioblocking Preparations on the Organism

"Comparative Investigation of the Effect of Certain Ganglioblocking Preparations on the Sympathetic and Parasympathetic Ganglia," by Ya. Shuster, V. sb.: Gangliolitiki i Blokatory Nervno Myshech. Sinapsov (Volume: Gangliolytics and Blocking Agents of the Neuromuscular Synapses), L., 1958, 50-63 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 60, Abstract No 28026, by E. I. Kandel')

"Anesthetized cats were used in the experiments conducted to determine the ganglioblocking activity and dominating effect of pentapyrrolidinium, hexonium, cyclamon, and P-2, P-3, and T-3 (new bis-ammonium compounds) on the sympathetic and parasympathetic ganglia. For this purpose a number of tests were conducted: the prevention of the hypotensive effect and bradycardia when the vagus nerve was stimulated, the removal of the contraction of the pupillary membrane caused by the continued excitation of the sympathetic stem, etc. The toxicity of the preparations was studied in mice. Doses of the preparations which produced a 50-percent maximal cholinolytic effect were used as indicators of cholinolytic activity. It was established that those preparations in which the quaternary nitrogen atoms were included in the heterocyclical systems are capable of greater ganglioblocking activity than are hexonium and tetramethylammonium iodide. The preparation T-3 (tetramethylene-1,4-bis-(piperidyl-diiodo methylate) which has an expressed effect on the sympathetic ganglia is of greatest practical interests. It has a wide spectrum of therapeutic action and can be easily synthesized for production."

94. Amizil, Cholinolytic Drug

"Amizil" (unsigned article); Moscow, Meditssinskiy Rabotnik, 7 Jun 60, p 3

"Amizil (Amicin) is a preparation with a strong cholinolytic action. It actively affects the peripheral and central cholinoreactive systems of the organism. Its application has been found useful in cases with asthenic and neurotic reactions, in patients with a syndrom of "alarm tendencies" and restlessness, and in cases of phobias and depressions. It is also effective in cases with toxic neuroses. In a number of cases amizil was found to be beneficial when used in conjunction with novocain, insulin,

barbiturates, aminazine, and meproten. The drug can be used also in the treatment of psychoneuroses in outpatients. Amizil is produced in the form of tablets, each containing 0.001 and 0.002 gram. It is taken internally in doses of 1-2 milligrams 3-5 times a day. The doses and duration of treatment must be on an individual basis depending on the effectiveness and tolerance of the preparation. The average duration of treatment is 4-6 weeks."

95. Benzoyl Luminal, a New Antispasmodic

"Acyl Derivatives of Barbituric Acid. I. N-Benzoylluminal," by L. P. Kulev, G. M. Stepnova, V. G. Stolyarchuk, and O. N. Nechayeva, Tomsk Polytechnic Institute; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 4, Apr 60, pp 1385-87

The authors described a method for obtaining N-benzoyl-luminal (which they have named "Benzonal") from luminal and its sodium salt. On the basis of the pharmacological tests and preliminary clinical evaluation, they have established that benzonal possesses strong antispasmodic activity, is less toxic than luminal, and does not manifest an hypnotic effect in therapeutic doses.

96. Blood Cholinesterase Affected by Cobalt

"On the Effect of Cobalt on the Activity of Blood Cholinesterase," by M. M. Kichyna; Minsk, Vestsi Akademii Navuk Belaruskay SSR - Seriya Biyalagichnykh Navuk, No 1, 1960, pp 78-84

The effect of cobalt sulfate on the activity of cholinesterase of the blood serum of dogs and rabbits was studied in vitro and in vivo by (1) subcutaneous injections of the microelement; (2) its long, chronic oral administration, mixed in food, to rabbits; and (3) the different functional condition of the nervous system.

The author found that (1) cobalt sulfate in vitro in doses of 50 to 10^{-3} mg of cobalt (reduced to the metal) per 100 ml of solution depresses the cholinesterase activity of the blood serum; (2) when cobalt sulfate in doses of 0.05, 0.5, 1, 2, and 5 mg of the metal per kilogram of weight was injected subcutaneously, depression of the cholinesterase activity of the blood serum was noted; (3) in feeding rabbits cobalt sulfate

in doses of 0.25 and 0.5 mg of metal per kilogram of weight for 55 days, the activity of the enzyme was intensified in experimental animals in comparison with control animals and in comparison with a preliminary period; and (4) the effect of cobalt on the activity of blood serum cholinesterase depends on the functional state of the nervous system.

97. Effect of Phenamine on Nervous System

"On the Effect of Certain Doses of Phenamine on the Cerebral Cortex and the Subcortical Apparatuses," by N. M. Litvinova, Tr. Ukr. n-i Psikhonevrol. In-ta, 1958, 29 (78), 261-266 (from Referativnyy Zhurnal -- Biologiya, No 2, 25 Jan 60, Abstract No 8746, by U. G. Gasanov)

"The effect of 5-25 milligrams of phenamine on food and defense conditioned reflexes in dogs was studied. The size of the optimal doses of phenamine depended on the nervous system of the animals. Large doses of phenamine produced modifications of the conditioned reflex activity, motor disturbances, the depression of the food reflex, etc. The mentioned modifications occurred either in the cortex or in the subcortical formations, depending on the dose of the drug administered. The repeated administration of large doses at times had no effect on the cortex, although they did cause disturbances in subcortical activity."

98. Therapy of Experimental Injury of Nervous System

"Effect of Pentoxyl and Metacilon the Course of an Experimental Injury of the Nervous System," by V. V. Kustov, V sb.: Lekarstv. Regulyatsiya Vospalit. Pro-tsessa (Medicinal Regulation of Inflammatory Process), 1958, 109-116 (from Referativnyy Zhurnal -- Biologiya, No 2, 25 Jan 60, Abstract No 8830, by I. L. Levin)

"The administration of pentoxyl [5-oxy-methyl-4-methyl-uracil, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, 1957] and metacil in doses of 40 milligrams per kilogram of body weight for the therapy of an experimentally induced injury of the sciatic nerve in mice caused earlier restoration of the pain reaction and disturbed motor functions in the experimental animals than in the control animals. The therapeutic effect of pentoxyl (more effective than metacil) was noted also in the initial period of the injury (first 3 days) when dibazole was ineffective. Under the influence of pentoxyl and metacil the pain reaction was restored first, with the disturbed motor functions restored at a considerably later period. In a number of cases, the application of pentoxyl for the therapy

of lumbo-sacral radiculitis and neuritis of the facial nerve produced beneficial results. The application of pentoxyl in a dose of 10 and particularly 40 milligrams per kilogram of body weight for the therapy of an experimentally induced cerebral trauma produced a definite therapeutic effect in the initial period of the affection (particularly during the first hours after the trauma) as well as in the restoration period."

99. Tetridin, New Soporific

"Tetridin" (unsigned article); Moscow, Meditsinskiy Rabotnik, 7 Jun 60, p 3

"Tetridin, a new preparation, is now being manufactured by the drug industry. Tetridin is a soporific! It has low toxicity and has no essential effect on respiration and circulation. Tetridin is prescribed for various forms of insomnia, the best effect being obtained when it is used in insomnias caused by functional disturbances of the central nervous system. The sleep induced by tetridin is similar to physiological sleep. It is manufactured in powder or tablet forms. The tablets contain 0.1-0.2 grams of the preparation. A single dose for adults is 0.1-0.3 grams. The largest single adult dose is 0.5 gram; a 24-hour dose is 1.5 grams."

100. Dimerin, New Soporific

"Dimerin" (unsigned article); Moscow, Meditsinskiy Rabotnik, 7 Jun 60, p 3

"Dimerin, a new preparation, is now available in the apothecary shops of the country. It is used as a soporific and tranquilizing drug. It has low toxicity and in soporific doses does not depress respiration and circulation. It produces no modifications of the internal organs. The preparation is prescribed for insomnia and nervous excitation. It acts within 20-40 minutes after its administration and sleep continues for 6-7 hours. Dimerin is available in tablet form, each tablet containing 0.05, 0.1, or 0.2 gram of the preparation. The soporific single dose for adults is 0.1-0.2 grams; when used as a tranquilizer it is administered in doses of 0.05 gram three or four times a day. Larger adult doses are 0.5 gram in a single dose or one gram in a 24-hour dose."

101. New Narcotic

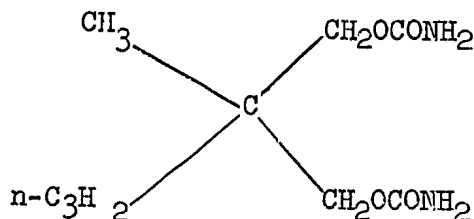
"Hydrocodone Phosphate" (unsigned article); Moscow, Medit-sinskiy Rabotnik, 17 Jun 60, p 3

"Hydrocodone phosphate is a new preparation being manufactured by the medicinal industry with properties similar to codeine. Hydrocodone phosphate is used in the control of coughs in patients suffering from diseases of the lungs or upper respiratory organs, particularly in cases in which codeine is ineffective. The drug is available in powder or tablet form. It is prescribed for adults in doses of 0.005 gram two to three times in 24 hours. If ineffective, the dose may be increased to 0.01 gram, and in rare cases to 0.015 gram. Largest single dose for adults is 0.02 gram; 24 hours dose, 0.06 gram. Doses of 0.001-0.002 grams are prescribed for children one to 2 years old; for older children, from 0.002 to 0.005 grams, depending on the effect obtained. It should be remembered that the drug may be habit forming on prolonged application."

102. Meprotran, Tranquilizing Drug

"Meprotran -- a Preparation With a Tranquilizing Effect," by S. S. Liberman and V. Ye. Galenko, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze and the Institute of Psychiatry, Academy of Medical Sciences USSR; Moscow, Meditinskaya Promyshlennost' SSSR, Vol 14, No 5, May 60, pp 54-55

Meprotran is a preparation which was synthesized by Prof M. Ya. Kraft and Ye. G. Popova at the All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze. Chemically it is 2-methyl-2-n-1,3-propanediol dicarbamate; its structural formula is as follows:



Meprotran is chemically similar to Miltown. It is a white crystalline powder, bitter in taste, and melts at a temperature of 105-106 degrees. Experimental investigations established that meprotran is a tranquilizer

and an antispasmodic. It was found to be effective when used in cases of neuroses, cyclothymia, depression states, vascular diseases, schizophrenias, and traumatic encephalopathies. The average 24-hour dose of the drug is 1.2-1.6 grams. It is well tolerated by the patients.

103. Reserpine in Therapy of Cardiac Insufficiency

"Therapy of Cardiac Insufficiency With Reserpine and Ganglioblocking Preparations, Predominantly in Patients Suffering From Hypertonia," by G. Ye. Perchikova, Candidate of Medical Sciences USSR, Institute of Therapy of Academy of Medical Sciences USSR; Moscow, Sovetskaya Meditsina, Vol 24, No 4, Apr 60, pp 43-47

The results of the clinical application of reserpine alone and in combination with such ganglioblocking preparations as hexonium, pentamin, and others to patients suffering from cardiac insufficiency due to hypertension and atherosclerosis showed that: (1) reserpine and reserpine in combination with ganglioblocking preparations were effective when used in the therapy of cardiovascular insufficiency due to hypertension; (2) Rauwolfia serpentina preparations when used separately or in combination with ganglioblocking drugs were effective in the therapy of cardiac insufficiency caused by hypertension in the systemic and pulmonary circulation systems; (3) therapy with ganglioblocking preparations is particularly advisable in cases of cardiac insufficiency caused by hypertonia in the pulmonary circulation system.

104. Myelosan in Therapy of Myeloid Leukosis

"Myelosan," (unsigned article); Moscow, Meditsinskiy Rabotnik, 7 Jun 60, p 3

"Myelosan is a new preparation effective when used in the therapy of acute chronic myeloid leukosis (the leukemic form). Under its influence a clinical and hematological remission occurs which is expressed in a general improvement of the patient, the spleen is reduced in size, and a change in the peripheral blood toward the restoration to normal takes place. Myelosan is manufactured in tablet form, each table containing 0.002 gram of the preparation. It is taken internally from one to three times a day before meals. The course of treatment is halted when signs of a hematological remission appear. Blood analyses should be made constantly during the treatment with this drug."

105. Effect of Pachycarpine on Organism

"Modification of Vascular Permeability and Tissue Circulation Due to the Effect of Pachycarpine," by K. M. Lakin, Uch. Zap. 2-y Mosk. Med. In-t (Scientific Notes of the Second Moscow Medical Institute), 1957, 6, 111-120 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 60, Abstract No 28033, by V. S. Shashkov)

"The effect of pachycarpine an alkaloid obtained from the plant Sophora pachycarpa, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, Medgiz, 1957, pp 132-134 (5 milligrams per kilogram of body weight) on the absorption of Na^{24} from the muscles was studied in 24 rabbits. When administered intramuscularly, it reduced from 9-11 to 6-7 minutes the period in which 50 percent absorption took place. Radioactivity was reduced by 80 percent in 18 minutes instead of 27 minutes. Pachycarpine, when administered intravenously, hastened the absorption of the isotope during the first few minutes; average activity was reduced by 50 percent during the first $4\frac{1}{2}$ -5 minutes and by 80 percent within 20-21 minutes."

Physiology

106. Vibration-Induced Vestibular Disorders

"Pathogenesis and Clinical Picture of Vibrational Cochleo-vestibular Disorders," by Prof Ya. S. Temkin, Clinical Department, Moscow Scientific Research Institute of Sanitation and Hygiene imeni F. F. Erisman; Moscow, Vestnik Otorino-Laringologii, Vol 22, No 3, May/Jun 60, pp 5-15

This article says that disturbances in cochleovestibular function are found frequently in workers employed in plants which manufacture reinforced concrete. Noise and vibration frequency play an important role in the pathogenesis of hearing disorders, causing reduced perception of both high and low sounds. A complete or partial extinction of the rapid component of experimental nystagmus is the objective symptom of central vestibular disturbance. Sometimes it is one of the earliest symptoms of vibration sickness.

107. Vibration Effects on Hearing

"The Effect of Vibration on Hearing and the Vestibular Apparatus," by P. S. Kublanova, Senior Scientific Associate, Clinical Department, Institute of Sanitation and Hygiene named F. F. Erisman; Moscow, Vestnik Otorino-Laringologii, Vol 22, No 3, May/Jun 60, pp 15-21

According to this article, the condition of cochleovestibular function was studied in 121 workers engaged in compacting reinforced concrete by means of vibration. Of this number, 54 were women and 67 were men; 79 workers were 30 years of age or under, 31 workers were between 31 and 40 years of age, and 11 workers were over 40 years of age. The workers were subjected to vibrations with frequencies of 50-100 hertz and amplitude of 0.15-1.3 mm. Reduced perception of low sounds through the air and bone was noted even in workers with limited service. A noticeable decrease in the perception of low sounds was observed in workers before a marked drop in perception to C₄₀₉₆ and C₂₀₄₈ was expressed. Changes which occurred in the vestibular apparatus were manifested mainly by reduced excitability of the labyrinth.

108. Human Body Oscillations During Vibration Tested

"Oscillations of Human Body Under the Effect of Vibration," by A. M. Volkov and V. Ya. Chirkov, Gigiyena Truda i Professional'-nyye Zabolevaniya, No 5, May 60, pp 8-12

Studies were made to determine the effect that vibration at frequencies of from one to 70 cycles produces on the human body. An accelerometer for simultaneous registration of the acceleration of oscillating movements of the human body and of the vibration stand was used in these investigations.

The investigations confirmed that the resonance nature of oscillations of the human body is within the frequency range of 5-8 cycles. It was also concluded that a frequency range of 17-25 cycles should be considered resonant for the human organism.

109. Bio-Effects of Noise

"Methods For Investigation of Physiological Changes in Human Body Due to the Effect of Noise," by A. I. Vozhzhova and I. A. Sapov; Moscow Gigiyena Truda i Professional'nyye Zabollevaniya, No 5, May 60, pp 36-40

To determine the nature of the effect of noise of medium and high intensity on the human body, the authors feel that it is advisable to employ a complex set of procedures that would permit detection of functional changes in the auditory, vestibular, cutaneous, and motor analyzers, as well as in the cardiovascular and central nervous systems. The recording of subjective data on 28 people under observation and the results of standard mathematical tests help in assessing the changes produced by noise in mental capacity.

110. Heat Exchange at High Temperatures Studied

"Heat Exchange in the Human Under High Temperature Conditions," by A. A. Dorodnitsyna and Ye. Ya. Shepelev; Leningrad, Fiziologicheskii Zhurnal SSSR, Vol 46, No 5, May 60, pp 607-612

The authors describe their investigation of heat exchange in men who were in a state of relative rest and were exposed to temperatures of 40°C, 50°C, 70°C, and 75°C. Values of heat production, heat emission, and heat accumulation in the organism were determined. The pulse rate and body temperature were registered. These heat exchange studies made it possible to determine the value of the heat load on man at various temperatures and to calculate the time during which the heat loads studied may be endured, depending on the speed of heat storage and the limiting admissible values of heat accumulated in the organism. A total of 121 observations were made on eight men between 25 and 35 years of age.

111. Muscle Activity Affected by Temperature

"Chemical Thermoregulation and Electrical Activity of Muscles in Different Animals During Relative Rest," by K. P. Ivanov, Laboratory of Ecological Physiology of Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR; Leningrad, Fiziologicheskii Zhurnal SSSR, Vol 46, No 5, May 60, pp 544-551

Simultaneous studies of gas exchange, body temperature, and electrical activity of muscles (of the back and hip) were carried out at various environmental temperatures in 35 white mice, 30 white rats, and 11 rabbits.

The gas exchange and the electrical activity of animal muscles in a natural position and in a state of complete apparent rest were found to decrease sharply when the temperatures reached a "critical point" (28°C - 31°C for white mice and white rats and 22°C - 23°C for rabbits) which corresponded to a minimum level of gas exchange. It was found that with a decrease of environmental temperature, the electrical activity of muscles increases in accordance with the increase of oxygen consumption. Dissection of the spinal cord at the level of the first and third thoracic segments induces strong disturbances in the above responses on the part of muscles lying below the level of section.

112. Reaction of Skin Thermoreceptors to Temperature Changes

"Reaction of Cutaneous Thermoreceptors to Local Reflex, and General Effect of the Stimulation Provoked by Temperature Changes," by L. M. Kurilova, Laboratory of Physiology and Pathology of Sense Organs, Institute of Normal and Pathological Physiology, Academy of Medical Sciences USSR; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 3, Mar 60, pp 3-7

In studying the reaction of thermoreceptors, the author states that he used a method of investigating the functional mobility in five subjects. It was observed that during local heating or cooling of short duration, a rapid and considerable demobilization of the receptor elements responding to both heat and cold occurs at the site of application of the thermal stimuli. Evidently, in this case the thermoregulating processes of the organism are not disturbed and the reaction, therefore, is only local. With prolonged application of heat, stimulation extended over a larger surface of the skin and a reflex reaction of the thermoreceptor system being observed became manifested in the changed adjustment of cutaneous thermoreceptors not subjected to the effect of thermal stimulation. In this instance a differentiated reaction to heating and cooling was noted: heating provoked demobilization of the thermoreceptors while cooling provoked their mobilization. A reciprocal relationship observed between the reaction of cold and heat receptor systems of the skin and the temperature changes in outside and inside air.

The data obtained show that cold receptor system reacts more rapidly and adequately to changes in external temperatures; the heat receptor system responds more readily to temperature changes within the body.

113. Decompression Changes in Irradiated Mice

"The Problem of Decompression Changes in the Blood," by V. Shust, Department of Comparative Physiology, Institute of Experimental Medicine; Leningrad, Fiziologicheskii Zhurnal SSSR, Vol 46, No 5, May 60, pp 618-622

This article discusses experiments performed to determine the nature of decompression changes in the blood of 50 adult white mice, and to learn the possible mechanisms of decompression erythropenia. This was done by comparing these changes in normal mice with those in mice subjected to total irradiation.

114. Implanted Electrodes Used to Test Cortical Representation

"Investigation of Electrical Phenomena in the Cerebral Cortex of a Dog During the Elaboration of Conditioned Defensive Reflexes," by V. N. Dumenko, Laboratory of Higher Nervous Activity, Institute of Physiology imeni A. A. Bogomolets, Academy of Sciences Ukrainian SSR; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 3, Mar 60, pp 8-12

This article discusses experiments with electrodes implanted into the cranial bones over the cortical ends of various analysors in two dogs. It was found that in the development of defensive reflexes there was clearly evident synchronism in the potential fluctuations in the areas of the cortical representation related to conditioned and unconditioned stimulations. This synchronism assumes particular constancy in the elaboration of a stereotype. In this connection it is noteworthy that, when the stereotype is elaborated for the posterior extremity, the electric activity of the representation area of the anterior extremity is never involved in the synchronous activity. These data evidently point to the fact that the connections, appearing in a dog's cerebral cortex during elaboration of conditioned reflex, acquire a selective character even in the early stages of reflex formation.

Public Health, Hygiene, and Sanitation

115. Infectious Diseases in Tadzhikistan

"Elimination of Infectious Diseases -- the Urgent Task of Medical Personnel of the Republic," by K. M. Chernovskiy, chief of Sanitary-Antiepidemiological Administration, Ministry of Health Tadzhik SSR; Stalinabad, Zdravookhrameniye Tadzhikistana, Vol 7, No 2 (34), Mar/Apr 60, pp 3-8

Considerable success has been achieved in the control of many diseases which previously were widespread in the republic. Malaria, which in the past affected many thousands of people, has now been almost eliminated in the republic, only 54 cases having been registered in 1959. Also practically eliminated are such diseases as epidemic relapsing fever, pappataci fever, trachoma, and fungi diseases. Medical facilities have been considerably increased. In January 1960, the republic had a total of 12,626 hospital beds. This number will be increased to 20,000 by the end of the Seven-Year Plan. About 2,000 physicians are now working at the various therapeutic and prophylactic establishments of Tadzhikistan; this is expected to reach 4,900 by the end of the Seven-Year Plan. The medical workers of the republic must accomplish the complete elimination of such infectious diseases as diphtheria, poliomyelitis, ancylostomiasis, typhoid fever, as cariasis, and acute enteric infections. The incidence of some of these is still considerably high in the republic. The main reason for this is the unsatisfactory state of the organization of the prophylactic vaccination campaign. Possibilities for the control and eradication of these diseases are available and the medical workers must do all possible to cope with this task.

116. Eradication of Infectious Diseases

"Control of Infectious Diseases in the Course of the Seven-Year Plan," by V. M. Zhdanov, Active Member, Academy of Medical Sciences USSR (Moscow); Moscow, Terapevticheskiy Arkhiv, Vol 32, No 5, May 60, pp 3-6

The complete eradication of a number of infectious diseases in the country is the goal of the Seven-Year Plan. Among these diseases are diphtheria, a disease which has been practically eliminated in the larger cities, such as Leningrad, Moscow, Rostov-na-Donu, and others, but is still prevalent in the rural areas and smaller towns; pertussis; poliomyelitis, a disease which is now being successfully controlled through the use of Salk and Sabin vaccines; syphilis, favus, and trachoma; ancylostomiasis which is still widespread in Georgia, Azerbaidzhan, Kirgizia; dysentery, measles, influenza, and other diseases. The author

is critical of the medical personnel in some areas who fail to take the necessary steps to cope with the problem of the control of infectious diseases and calls for greater efforts for the fulfillment of this important task.

117. Bloc Conference on Public Health Organization

"Symposium on the Organization of Public Health in Socialist Countries" (unsigned article); Moscow, Meditsinskiy Rabotnik, 9 Mar 60, p 1

"A symposium of organizers of public health in socialist countries began discussions on 28 March in Moscow at the Institute for the Organization of Public Health and the History of Medicine imeni N. A. Semashko on the subject of coordinating scientific research in the field of public health.

"The following people took part in the discussion: Komo Gargov, Deputy Minister of Health and Social Welfare of the Bulgarian People's Republic, and Todor Zakhariyev, rector of Plovdiv Medical Institute; Dr Ishtvan Shimonovich, Deputy Minister of Health of the Hungarian People's Republic, and Dr Ferents Fodor, head of the Budapest city health department. The GDR was represented by the following: Dr Gerhardt Missgeld, head of the scientific department of the German Ministry of Health, Dr Werner Gehring, chief of the medical department of the Central Committee of the United Socialist Party of Germany, Dr Kurt Winter, director of the Institute of Hygiene of Humboldt University, Dr Werner Schminke, director of the Institute of Hygiene of the Medical Academy in Dresden, and Dr Moritz Moebel, a scientific associate of Humboldt University.

"The People's Republic of China sent two delegates: T'an Chih, director of the Peking Institute for Advanced Training of Medical Personnel, and Yen Yuch, instructor of the chair of organization of health service of the institute. The Democratic People's Republic of Korea was represented by Li Den Yur, an aspirant at the Institute for the Organization of Public Health imeni N. A. Semashko. Also present were: Dr Tsagaan Khauu, head of the chair of social hygiene of the medical faculty of the Mongolian University; Seym (diet) deputy Dr Felix Vidy-Virskiy, member of the commission on public health of the Central Committee of the Polish United Workers Party; Zigmund Branovintner, director of the medical statistics department of the Ministry of Health of Poland; Dr Zdenek Shtikh, Deputy Minister of Health of Czechoslovakia, and Rudol'f Buresh, head of the chair of organization of public health of the medical faculty of Karlov University in Plzen.

"Representing the Soviet Union were the following: S. V. Kurashov, Minister of Health USSR; N. A. Vinogradov, Minister of Health RSFSR; I. G. Kochergin, Deputy Minister of Health USSR; V. N. Butrov and F. G. Zakharov, members of the Collegium of the Ministry of Health USSR; Director Ye. D. Ashurkov and Deputy Director A. B. Shevelev of the Institute for the Organization of Public Health and History of Medicine imeni Semashko.

"S. B. Kurashov, Minister of Health USSR, delivered the opening, address, greeting the representatives of public health service of socialist countries in the name of the Collegium of the Ministry of Health USSR. He stressed the great theoretical and practical significance of their joint effort to solve the scientific problems in the field of health protection.

"Docent Ye. D. Ashurkov read a report, during the first session, on scientific principles involved in the organization of health service.

"Representatives of the socialist countries will also attend the conference of most active public health workers of Ryazanskaya Oblast."

118. Effect of Small Doses of Harmful Substances on Organism

"Effect of Small Doses of Harmful Substances in Industrial Waste Waters on Conditioned Reflex Activity in Experimental Animals," by S. N. Cherkinskiy (Corresponding Member of Academy of Medical Sciences USSR) and V. N. Tugarinova (Candidate of Medical Sciences), Chairs of Public Hygiene and Pathological Physiology, First Moscow Medical Institute; Kiev, Vrachebnoye Delo, No 5, 1960, pp 527-530

"The application of the conditioned reflex method has been found highly useful not only in the study of the effect of different toxic substances on higher nervous functions, but also in the determination of the threshold of their action to establish their hygienic norms. The conditioned reflex method in conjunction with other physiological methods has found particularly wide application in the determination of the maximum allowable concentrations of harmful substances in industrial waste waters, mainly for the purpose of safeguarding the sanitary conditions of water reservoirs. For this purpose the conditioned reflex activity of the experimental animals was studied after they had been orally administered a number of chemical substances: inorganic compounds of arsenic, lead, mercury, selenium, fluorine, hydrocyanic acid, and some organic compounds (hexachloran, styrol, caprolactam, dinitro-chlorobenzene, and dinitrobenzene). The investigations of conditioned reflex activity in the experimental animals was carried out against a background of prolonged action (4-8 months) of small doses of the substances under investigation.

"An analysis of the results of the investigations revealed that the substances being investigated produced modifications of conditioned reflex activity in the animals which were predominantly of a monotypical nonspecific nature. These modifications were manifested in the weakening of internal inhibition (an increase in the number of cases of disinhibition of differentiations and a tendency of the inhibition process toward irradiation; a diminution in the strength of the excitation process -- decrease in the magnitude and length of the latent periods of the reactions to positive conditioned stimuli and the development of defensive inhibition; the appearance of phase conditions -- comparative, paradoxical, and anesthetizing..

"Other physiological and biochemical methods were used in the investigation at the same time: study of chronaxy, determination of the rapidity of the flexor reflex, an analysis of the urine content of urobilin, protein, nitrogen, pyruvic acid, and free oxygen; a study of the blood sugar content when loaded with galactose; the activity of the blood enzymes (cholinesterase, amylase, phosphatase, catalase), etc. As a rule, the morphological picture of the blood was studied, and histological investigations of the tissues and organs were conducted.

"In the overwhelming majority of cases, the modifications appeared first and, despite the nonspecific nature of the changes in conditioned reflex activity, made it possible to identify the effect of smaller doses of the harmful substances than it would have been possible to discover by any other method of investigation."

119. Statistics on USSR Hospital and Outpatient Facilities

"Hospital and Outpatient Facilities Available to the Population During 1958 in Establishments Which Are Under the Jurisdiction of the Ministry of Health USSR (Figures Given are Based on Statistical Reports on File in the Ministry of Health USSR)," Sovetskoye Zdravookhraneniye, No 3, 1960, pp 90-93

The following five tables give statistics on hospitals and outpatient facilities in the USSR.

Table 1. Number of Establishments Offering Hospital Service
(Both in Urban and Rural Areas)

Republic	Total	Type of Establishment								
		Oblast Hos- pitals	City Hos- pitals	Rayon Hos- pitals	Medical District Hospitals	Wards in Out- patient Clinics	Mater- nity Homes	Hospi- tals for non- Commu- nicable Chil- dren's Dis- eases	Hos- pitals and Colo- nies for neurot- ics	Other Hos- pital Estab- lish- ments
RSFSR	13,520	77	2,442	1,993	6,535	874	479	424	169	527
Ukrainian SSR	4,842	26	720	719	2,305	548	103	148	48	225
Belorussian SSR	925	7	67	145	578	60	15	11	13	29
Uzbek SSR	845	8	95	131	390	129	32	13	6	41
Kazakh SSR	1,575	14	168	191	928	142	38	33	13	48
Georgian SSR	629	4	52	65	337	58	50	19	8	36
Azerbaydzhan SSR	538	2	58	68	260	80	21	23	4	22
Lithuanian SSR	290	6	32	81	113	29	9	2	6	12
Moldavian SSR	326	1	18	34	224	25	6	7	1	10
Latvian SSR	259	1	47	41	103	40	4	5	7	11

<u>Republic</u>	<u>Total</u>	<u>Type of Establishment</u>								
		<u>Oblast Hos- pitals</u>	<u>City Hos- pitals</u>	<u>Rayon Hos- pitals</u>	<u>Medical District Hospitals</u>	<u>Wards in Out- patient Clinics</u>	<u>Mater- nity Homes</u>	<u>Hospi- tals for non- Commu- nicable Chil- dren</u>	<u>Hos- pitals and Colo- nies for Psycho- neurot- ics</u>	<u>Other Hos- pitals Estab- lish- ments</u>
Kirghiz SSR	241	5	29	42	119	21	8	8	3	6
Tadzhik SSR	222	3	31	45	101	19	4	4	3	12
Armenian SSR	253	1	31	31	129	18	17	12	3	11
Turkmen SSR	287	4	45	35	108	71	7	4	2	11
Estonian SSR	222	2	32	35	104	29	3	2	5	10
Total in USSR	24,974	161	3,867	3,656	12,334	2,143	796	715	291	1,011

Table 2. Number of Establishments Rendering Outpatient Medical Aid
(Both in Urban and Rural Areas)

Republic	Total	Type of Facility								
		Oblast Hos- pitals	City Hos- pitals	Rayon Hos- pitals	Medical District Hospitals	Hospi- tals for Non- Communi- cable Child- rens	Mater- nity Homes	Out- patient Clinics of all Types	Medical Posts	Inde- pendent Out- patient Clinics, Ambula- toriums, and Consul- tations
RSFSR	19,742	74	2,411	1,986	6,532	398	464	1,169	4,565	2,143
Ukrainian SSR	6,427	26	719	719	2,305	147	103	596	1,386	426
Belorussian SSR	1,251	7	67	145	578	11	15	86	180	162
Uzbek SSR	1,285	7	93	131	390	12	31	138	291	192
Kazakh SSR	1,772	14	168	191	928	33	38	160	221	19
Georgian SSR	1,255	4	51	65	337	19	50	90	119	520
Azerbaijdzhan SSR	807	2	54	68	260	19	18	91	95	200
Lithuanian SSR	430	6	32	81	113	2	9	33	45	109
Moldavian SSR	367	1	18	34	224	7	6	27	48	2
Latvian SSR	47								93	138

Table 2. Number of Establishments Rendering Outpatient Medical Aid
(Both in Urban and Rural Areas)

Republic	Total	Type of Facility								
		Oblast Hos- pitals	City Hos- pitals	Rayon Hos- pitals	Medical District Hospitals	Hospi- tals for Non- Communi- cable Chil- drens	Mater- nity Homes	Out- patient Clinics of all Types	Medical Posts	Inde- pendent Out- patient Clinics, Ambula- toriums, and Consul- tations
RSFSR	19,742	74	2,411	1,986	6,532	398	464	1,169	4,565	2,143
Ukrainian SSR	6,427	26	719	719	2,305	147	103	596	1,386	426
Belorussian SSR	1,251	7	67	145	578	11	15	86	180	162
Uzbek SSR	1,285	7	93	131	390	12	31	138	291	192
Kazakh SSR	1,772	14	168	191	928	33	38	160	221	19
Georgian SSR	1,255	4	51	65	337	19	50	90	119	520
Azerbaijdzhan SSR	807	2	54	68	260	19	18	91	95	200
Lithuanian SSR	430	6	32	81	113	2	9	33	45	109
Moldavian SSR	367	1	18	34	224	7	6	27	48	2
Latvian SSR	477				113			47	93	138

Republic	Type of Facility									
	Total	Oblast Hos- pitals	City Hos- pitals	Rayon Hos- pitals	Medical District Hospitals	Hospi- tals for non- Commu- nica- ble Chil- drens Dis- eases	Mater- nity Homes	Out- patient Clinics of all Types	Medical Posts	Inde- pendent Out- patient Clinics, Ambula- toriums, and Consul- tations
Kirghiz SSR	274	5	29	42	119	8	8	24	34	5
Tadzhik SSR	256	3	31	45	101	4	4	28	38	2
Armenian SSR	378	1	30	30	129	9	17	31	67	64
Turkmen SSR	314	3	45	35	108	4	7	73	32	7
Estonian SSR	273	2	32	35	104	2	3	32	48	15
Total in USSR	35,308	156	3,825	3,648	12,331	680	777	2,625	7,262	4,004

Table 3. Bed Capacity of Hospital Establishments
(Both in Urban and Rural Areas)

Republic	Total No of beds Available as of 31 Dec 58	Type of Facility →					
		For Thera- peutic Patients	For Surgical Patients	For Pregnant and Parturient	For Gyneco- logical Patients	For Children (non com- municable diseases)	TB (both adults and children)
RSFSR	843,508	164,070	123,466	90,605	43,228	74,685	59,056
Ukrainian SSR	290,645	62,859	43,063	28,549	15,983	25,208	36,400
Belorussian SSR	47,210	9,231	6,654	5,438	1,772	3,759	4,086
Uzbek SSR	47,455	10,895	5,509	4,982	1,166	3,720	5,748
Kazakh SSR	67,955	12,807	8,873	8,227	2,654	5,545	6,227
Georgian SSR	26,377	6,778	4,413	3,087	1,276	2,119	2,057
Azerbaydzhan SSR	23,580	5,400	3,060	2,473	1,000	2,006	2,095
Lithuanian SSR	19,110	3,801	2,991	2,290	849	1,498	2,345
Moldavian SSR	18,650	4,339	2,406	1,976	809	2,249	2,210
Latvian SSR	20,380	3,587	3,531	1,570	1,070	1,436	2,025
Kirghiz SSR	12,805	2,712	1,892	1,486	429	1,276	1,615
Tadzhik SSR	11,319	1,905	1,307	1,188	278	976	1,041

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<u>Republic</u>	<u>Type of Facility</u>							
	<u>Diseases of the Eyes</u>	<u>Otolaryngological</u>	<u>Skin and Venereal</u>	<u>Communicable diseases in Children and Adults</u>	<u>Mental Patients</u>	<u>Patients with Nervous Disorders</u>	<u>General Medical</u>	<u>Other</u>
RSFSR	14,373	8,185	13,787	97,327	82,502	12,969	42,834	16,421
Ukrainian SSR	4,330	3,976	4,813	23,121	28,660	4,877	481	8,325
Belorussian SSR	573	448	1,001	3,831	5,065	684	3,092	1,576
Uzbek SSR	1,410	254	1,860	5,882	3,175	413	851	1,590
Kazakh SSR	850	312	2,265	7,368	4,215	419	6,643	1,550
Georgian SSR	243	264	849	2,646	1,800	515	190	140
Azerbaijani SSR	790	241	827	2,358	1,370	336	1,484	140
Lithuanian SSR	295	300	405	1,483	2,185	209	459	---
Moldavian SSR	345	223	497	1,708	1,375	127	186	200
Latvian SSR	227	214	297	1,720	2,950	394	1,214	145
Kirghiz SSR	130	70	480	1,535	950	112	118	---
Tadzhik SSR	430	60	343	1,460	700	250	1,211	170

<u>Republic</u>	Total No of beds Available as of 31 Dec 58	Type of Facility →					
		For Thera- peutic Patients	For Surgical Patients	For Pregnant and Parturient	For Gyneco- logical Patients	For Children (non-com- municable diseases)	TB (both adults and children)
Armenian SSR	11,305	2,018	1,529	1,612	343	1,320	860
Turkmen SSR	11,495	2,199	1,243	1,206	368	812	1,075
Estonian SSR	10,875	1,919	1,578	928	557	838	1,080
Total in USSR	1,462,669	294,520	211,515	155,617	71,782	127,447	127,920

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<u>Republic</u>	<u>Type of Facility</u>							
	<u>Diseases of the Eyes</u>	<u>Otolan- yingo- logical</u>	<u>Skin and Venereal</u>	<u>Commu- nicable diseases in Children and Adults</u>	<u>Mental Patients</u>	<u>Patients with Nervous Disorders</u>	<u>General Medical</u>	<u>Other</u>
Armenian SSR	154	107	140	914	970	139	1,099	100
Turkmen SSR	1,170	108	658	1,371	850	125	45	265
Estonian SSR	101	89	147	1,060	1,430	103	940	105
Total in USSR	25,421	14,851	28,369	153,784	138,197	21,672	60,847	30,727

Table 4. Urban and Rural Population Hospitalized

<u>Republic</u>	Total No. of Patients Admitted in City and Rural Hospitals Estab- lishments (1,000)	<u>Residence</u>	
		<u>Urban Population</u>	<u>Rural Population</u>
RSFSR	19,856.1	11,400.7	8,455.4
Ukrainina SSR	7,217.9	3,807.2	3,410.7
Belorussian SSR	1,175.1	405.2	769.9
Uzbek SSR	1,097.9	494.3	603.6
Kazakh SSR	1,498.1	718.3	779.8
Georgian SSR	534.0	252.9	281.1
Azerbaydzhan SSR	482.4	294.8	187.6
Lithuanian SSR	357.6	169.9	187.7
Moldavian SSR	422.8	115.0	307.8
Latvian SSR	357.8	201.7	156.1
Kirghiz SSR	319.1	134.1	185.0
Tadzhik SSR	267.5	115.8	151.7
Armenian SSR	262.9	140.0	122.9
Turkmen SSR	237.8	156.1	81.7
Estonian SSR	215.6	126.0	89.6
Total in USSR	34,302.6	18,532.0	15,770.6

Table 5. Outpatient Medical Service to Population

<u>Republic</u>	<u>No of Ambulatory Visits Handled by Physicians (1,000)</u>	<u>No of Home Visits Made by Physicians (1,000)</u>	<u>No of Persons Who Receive Medical Aid (in connection with accidents and illnesses) by First Aid Stations (1,000)</u>
RSFSR	536,320.0	41,446.6	10,284.0
Ukrainian SSR	194,117.3	14,691.4	3,835.6
Belorussian SSR	25,809.2	1,951.3	777.6
Uzbek SSR	27,372.5	2,241.9	558.8
Kazakh SSR	28,630.1	2,820.9	709.8
Georgian SSR	22,865.0	1,900.6	251.8
Azerbaijdzhan SSR	19,726.1	2,232.0	490.7
Lithuanian SSR	11,059.3	599.3	186.5
Moldavian SSR	7,775.2	617.3	194.4
Latvian SSR	12,248.5	761.4	208.8
Kirghiz SSR	6,933.2	782.0	142.4
Tadzhik SSR	4,680.3	392.4	195.8
Armenian SSR	6,674.8	1,137.4	155.5
Turkmen SSR	5,426.4	491.7	136.4
Estonian SSR	6,167.2	510.0	90.6
Total in USSR	915,805.1	72,578.2	18,218.7

Radiology

120. Effect of Various Intratracheally Administered Anesthetics on Radiation Sickness

"Intratracheal Ether Anesthesia in Surgical Operations on Lungs During the Period of Radiation Sickness" (Experimental Research), by A. D. Yarushevich, Surgical Clinic for Advanced Training of Physicians, Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Vestnik Khirurgii imeni I. I. Grekov, Vol 84, No 5, May 60, pp 87-92

The purpose of the research described was to evaluate the effect of ether anesthesia in surgical operations on the course and outcome of radiation injuries. Tests were conducted on 40 experimental dogs subjected to general X-irradiation by 350-500 r and operated on under the effects of various anesthetizing agents.

The author presents the following conclusions

1. Intratracheal ether anesthesia administered in experiments on dogs subjected to traumatic surgical operations on the lungs during the latent, initial, and pronounced periods of radiation sickness was not reflected unfavorably by the course of radiation sickness and did not increase the mortality of the irradiated animals. The elimination of motor stimulation by the administration of an anesthetic improves the outcome of the intervention.
2. Morphine, atropine, and aminazine can be used for premedication purposes without any adverse effects on the course of radiation sickness.
3. Anesthesia by the intravenous introduction of thiopentalsodium or pentothal did not reflect unfavorably on the postoperative course of the irradiated animals.
4. The use of ditiline for muscle relaxation in the experimental animals requires caution, since evidently it imparts to them increased sensitivity. Hexonium and pentamine did not exert a hypotensive effect on the experimental animals suffering from radiation sickness.

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121. Excessive Ovulation of X-Irradiated Rats a Compensatory Response Reaction

"Excessive Ovulation of Rats Subjected to X Irradiation," by Ye. A. Pozhidayev, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Doklady Akademii Nauk SSR, Vol 131, No 3, 21 Mar 60, pp 670-672

The research described is a further study of work reported by L. B. Russell et. al., who have stated that after a single total X irradiation of mice by 400 r, the number of yellow bodies in the ovaries not only is not decreased, but for a period of 2 weeks is increased.

The author subjected rats to a single total X-irradiation by a 600 r doses as follows: whole-body X irradiation, irradiation of both ovaries while the rest of the body was screened, screening of the ovaries in total irradiation, irradiation of one ovary while the body was screened and screening of one ovary while the rest of the body was irradiated. Data presented in two tables show the number of pregnancies per rat and the number of yellow bodies per rat.

The data obtained by the author confirm the results reported by Russell et. al., and make it possible to present the following conclusions:

1. The decrease in the size of litters of irradiated animals is not a consequence of a decrease in the number of ovulations, but it is due to a very high antenatal mortality rate of the embryos at various stages of development.
2. Excessive ovulation was observed only in those cases in which the ovaries alone were irradiated (by local irradiation or by irradiation of the female); the effect was removed by screening the ovaries, which indicates that the hormones from the anterior lobe of the hypophysics do not participate in this [excessive ovulation].
3. Experiments dealing with unilateral irradiation of the ovaries showed that the rise in the number of yellow bodies occurred only in the protected ovaries, while in the irradiated ovaries, the number of yellow bodies was not increased. The increase in the activity of the ovary after irradiation is explained as a response to a signal from the side of the injured ovary and a reflex compensatory process characteristic for paired organs.

122. Pathological Changes in Interneural Connections in Experimental Radiation Sickness Described as Toxic Dystrophic

"Morphological Changes of Synaptic Formations of the Central Nervous System in Experimental Chronic Radiation Sickness," by A. G. Khanin, Institute of Neurology, Academy of Medical Sciences USSR; Moscow, Zhurnal Nevropatologii i Psikhatrii imeni S. S. Korsakov, Vol 60, No 5, May 60, pp 522-528

Pathological changes, occurring in the synaptic formations of various parts of the central nervous system of dogs subjected to daily doses of 15 r for up to 169 days were studied.

Results of histopathological studies of interneural synaptic connections in the central nervous system during experimental chronic radiation sickness make it possible to characterize the pathology as toxicodystrophic, developing by stages. The severity of the phenomenon of dystrophy depended on the resistance of the organism (high, medium, and low) to ionizing radiations, the total doses (in this case 1,095, 1,545, and 2,175 r), and the duration of irradiation (85, 120, and 169 days).

Analogous toxicodystrophic damaging changes in the synaptic formations of the central nervous system due to chronic intoxication by occupational poisons (lead, aniline, and arsenic) were detected by M. S. Tolgska. This may confirm the suggestion that the nature of the pathology of interneural connections in experimental chronic radiation sickness is toxicodystrophic.

The data obtained indicate that the resistance of the synaptic apparatus during experimental chronic radiation sickness is relative. It depends on the stage of the development of the sickness, the resistance of the animals, the total dose of ionizing radiations, and the duration of irradiation. A. D. Zurabashvili and B. R. Naneyshvili, on the basis of their observations concerning changes occurring in acute radiation sickness, point out the significance of the duration and the magnitude of the action of penetrating radiations.

The pathological shifts in the interneural structures during the first two stages are reversible. During the third and fourth stages, against a background of recovery reaction shifts, an irreversible component of the reaction (coarse necrobiotic changes) may be expressed to a significant degree.

Finally, the author calls attention to the fact that literature describing morphological changes occurring in acute radiation sickness disregards the dynamics of the changes in the terminal parts of interneural structures; therefore, research along this line, as shown by the article described, is necessary.

123. Histopathological Changes in Central Nervous System of Gamma-Irradiated Animals

"Histopathological Changes in the Central Nervous System of Animal Organisms Subjected to the Effect of Total Gamma-Irradiation by Large Doses," by A. F. Bibikova; Moscow, Zhurnal Nevropathologii i Psikhiiatrii imeni S. S. Korsakova, Vol 60, No 5, May 60, pp 529-534

Histopathological changes in the various branches of the central nervous system of mature dogs subjected to total gamma irradiation from cobalt-60 equaling 20,000, 15,000, 10,000, and 5,000 r were studied.

The author discusses the problem of the selectivity of radiation injury in the various branches of the central nervous system (cerebrum, cerebellum brain stem, the ventricles, capillary plexuses, etc.) and attributes the different degrees of injury to motor cells in the spinal cord as probably due to a different functional condition at the moment of irradiation.

In analyzing the histological data obtained, the author points out that with time the development of radiation injury in the animal central nervous system depends on the dose of irradiation (the larger the dose, the sooner the onset of the animal's death); however, the nature of the pathological process and its topographical distribution are identical.

Histological changes appear in all the structural elements of the central nervous system under the general effect of gamma irradiation by 5,000 — 20,000 r, the most serious being in the nerve cells and the fibers. The results reported by the author agree with earlier results reported by A. D. Zurabashvili and Naneyshvili and confirm the theory that pathological changes arise in the central nervous system subjected to the effects of penetrating radiations not as a result of hemodynamic disturbances, but as a consequence of the direct and immediate effect of irradiation on the brain and spinal cord.

Although the hemodynamic disturbance should not be underestimated, the author finds it difficult to explain the serious pathological changes in the nerve cells, in the myelinated nerve fibers, and partially in the glial apparatus simply as disturbances of the vascular system, wherein morphological changes are considerably less marked.

The author concludes that brain tissue edema in the area of the third and fourth ventricles has a special significance in the development of the pathological process, and in the onset of the animal's death under the effect of large doses of gamma irradiation. Furthermore, disturbed tissue respiration, which is substantiated by quantitative and qualitative changes in argyrophyl granularity, apparently, plays an important role in the mechanism of the development of radiation dystrophy of brain tissue.

124. Absorption, Distribution, and Measurement of Neutron Energy in Tissues

Tkanevaya Doza Neytronov (Tissue Dosis of Neutrons), by M. I. Shal'nov, edited by B. M. Isayev: Moscow, 1960, 219 pp

This book discusses the problem of the tissue dose from three aspects: the mechanism of absorption and the characteristics of the distribution of the absorbed energy of various types of radiations into the tissues: the relationship between the biological effects and the absorbed energy of a given type of radiation: and the development and design of instruments and methods of dosimetry by means of which the measurement of the tissue dose become possible.

The book consists of nine chapters; the table of contents follows:

Introduction

Chapter I.

Fundamental Properties of Neutrons
Sources of Neutrons

Chapter II. The Interaction of Neutrons With a Substance

A Short Review of the Processes of Interaction
Effective Neutron X-Sections, and the Constants of Interaction

Chapter III. The Interaction of Neutrons With a Tissue, and the Tissue Dose

The Chemical Composition of Biological Tissues and the Processes of the Interactions of Neutrons With the Nuclei of the Atoms of a Tissue
Energy Losses of Charged Particles in Tissues
Units of Tissue Dose

Chapter IV. Tissue Doses of Slowed Neutrons, and Neutrons of Intermediate Energies

The Dose of Thermal Neutrons Which Is Formed in Objects Being Irradiated as a Result of the Slowing of Fast Neutrons
Tissue Dose of Thermal Neutrons Diffusing From Outside
Tissue Dose of Neutrons of Intermediate Energies

Chapter V. Tissue Dose of Fast Neutrons

The Absorption of Energy From Narrow Beams of Monoenergetic Neutrons

The Absorption of Energy From Wide Beams of Monoenergetic Neutrons

The Absorption of Energy of Fast Neutrons From Complex Spectra

Chapter VI. Tissue Dose of Very Fast and Superfast Neutrons

The Absorption of Energy From Narrow Beams of Monoenergetic Neutrons

The Absorption of Energy From Wide Beams of Monoenergetic Neutrons

The Absorption of Energy From Very Fast and Superfast Neutrons of Complex Spectra

Chapter VII. Maximum and Average Tissue Doses of Neutrons

Maximum Tissue Dose

Average Tissue Dose

Conditions For Equal Tissue Doses of Two Comparable Types of Radiations

Chapter VIII. The Biological Effectiveness of Nuclear Radiations, and the Problem of the Maximum Permissible Dose

Comparative Biological Effectiveness of Nuclear Radiations, and Linear Energy Loss

Deep Tissue Doses of Neutrons With the Consideration of the Comparative Biological Effectiveness of Secondary Radiations

Maximum Permissible Doses of Neutrons

Chapter IX. Instruments and Methods of Neutron Dosimetry

Dosimetry of Slowed Neutrons

Dosimetry of Fast Neutrons

Dosimetry of Very Fast and Superfast Neutrons

Tissue-Like Images for the Study of Deep Doses of Neutrons

Conclusion

Bibliography

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Surgery

125. Chinese Experiments in Vascular Prosthesis

"Report on the Transplantation of Nylon Vascular Prosthesis in Animals in Experimental Traumatotherapy," by Cheng Pao-ch'i (鄭寶琦) and Kuo En-t'an (郭恩瑩), Department of Surgery, Second Military Medical University and Chiang Ching-t'ao (蔣景濤), Department of Pathological Anatomy, Second Military Medical University; Peiping, Chung-hua Wai-k'o Tsa-chih (Chinese Journal of Surgery), Vol 8, No 2, Feb 60, pp 114-118

By way of introduction, the authors note that vascular isografts and autografts have proved useful in the repair of extensively traumatized blood vessels, but since such materials are hard to come by and require special storage equipment, they can hardly meet the needs of a nation during war.

This paper reports the results of experiments initiated in September 1958 to determine whether a nylon vascular prosthesis manufactured in China can be used to repair blood vessels damaged under traumatic conditions. In the course of their study, the authors transplanted the synthetic blood vessels in nine adult dogs that had sustained experimental traumatic wounds and required repair of the abdominal aorta. Five dogs survived the operation. Three died of infection and one of shock. The authors conclude that histological studies indicated the feasibility of clinical use of the vascular substitute if early debridement is carried out and if operative infection is controlled by adequate use of antibiotics.

126. New Type of Surgical Dressing

"Better Than Bandages" (unsigned article): Prague, Hospodarske Noviny, No 20, 13 May 60, p 4

Dr Macik of the Research Institute of Traumatology in Brno, in cooperation with the Research Institute of Rubber and Plastic Technology, has developed a chemical plastic material which will replace conventional dressings for wounds, abrasions, burns, etc. The material is applied in a fluid state and quickly solidifies, creating a transparent film over the injury.

The film is permeable to perspiration. The injuries heal faster than when conventional dressings are used and progress in healing can be observed through the film. The Czechoslovak material exceeds the quality of similar materials produced abroad and is produced entirely from domestic raw materials.

Veterinary Medicine

127. Aujeszký Disease in Rats

"Virus Isolation From Virus-Carrying Gray Rats With Aujeszký Disease", by M. G. Nikitin, Chair of Epizootology, Khar'kov Veterinary Institute; Moscow, Zoologicheskii Zhurnal, Vol 39, No 2, 1960, pp 282-287

"Wild gray rats do not always perish from Aujeszký disease: 37% live without showing any symptoms. The survival rate depends on both the state of the rat organism as well as the virus dosage. When infected with a 0.6-ml dose, 4.7% of the rats survived; with a 0.5-ml dose, 7.2% survived; and with a 0.3-ml dose, 19.6% survived. The internal organs of the surviving rats contained the virus of Aujeszký disease up to 131 days after infection. The virus is found most often in the lungs, urinary bladder walls, and urine. Under natural infection conditions, during Aujeszký disease enzootics of pigs, the virus-carrying period in gray rats may last up to 100 days."

128. Bone Marrow and Pathogenesis in Virus Diseases of Animals

"Bone Marrow and Pathogenesis in the Case of Several Virus Diseases of Domestic Animals," by K. H. Pehl, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 13, No 6, 1959, pp 1054-1206

This exhaustive study represents an attempt to provide, with the aid of hematological methods of investigation, further explanation of the pathogenesis of several virus infections of domestic animals, particularly virus diseases with a septicemic character. Since these virus infections reveal changes in the blood which are so regular that they are of diagnostic value, and since a particular affinity for the erythrocytes is present in these virus diseases, it should be expected that, through systematic testing of the bone marrow and blood during the course of infection with the individual diseases, additional information on the pathogenesis might be obtained. To obtain the broadest possible basis of comparison, along with these polyorganotropic pathogens, the cytologic syndromes were investigated following infection with neurotropic and pneumotropic pathogens, and for further comparison, bone marrow cell studies were done following the application of nonspecific stressors, histamina, and diphtheria toxin.

The findings show that in the investigated virus infections, a fundamental distinction is to be drawn between the pneumotropic and neurotropic virus diseases, on the one hand, and between the pneumotropic and the

polyorganotropic, on the other hand. In the first group, from which the Borna virus infection of horses and sheep, the infection of pigs with Teschen porcine virus encephalitis, and infection with swine influenza virus were investigated, no particular, regularly repeating conditions could be ascertained. On the other hand, after inoculation of pathogens which produce septicemic infections, such constant and regularly repeating symptoms appeared in the bone marrow cells and blood that a particular hemodynamic effect must be ascribed to these types of virus. These include infection with the swine influenza virus, with the virus of infectious anemia of horses, and with the virus of Newcastle disease. Even though the types and degrees of change in the bone marrow cell syndrome during these virus infections are different, they appear so consistently and with such a high intensity that they cannot simply be interpreted as a result of a general defense against infection. Moreover, they must be viewed in a causal connection with the multiplication of the virus. A definitive study is made of the question of whether, in addition, there is within this group also a common, uniform genesis of the changes in the bone marrow and blood syndrome, such as might be assumed from the parallelism of the pathological-anatomical changes. The findings from the neurotropic and pneumotropic group are compared with those of the polyorganotropic group insofar as they appear to be essential to the explanation of the pathogenesis.

In the course of neurotropic and pneumotropic virus infections in domestic animals, no, or only insignificant, changes occur in the composition of the bone marrow cell syndrome. The changes which do occur are to be traced back to the most varied secondary infections and secondary reactions and, as a rule, are observed only after clinical manifestation of the infection. The type and extent are primarily conditioned by the intensity, duration, and point of attack of the secondarily effective noxa. The virus infection itself causes here no, or only quite limited, changes in the bone marrow. In this connection, it is noteworthy that in infections of this group the blood and bone marrow contain virus only temporarily, and that no affinity on the part of the virus for the blood cells is observed.

Thus, in the preclinical stage of infection of horses and sheep with Borna disease virus, the blood marrow cell picture gives no indications that it is influenced by special accelerating or inhibiting stimuli. A slight activation of granulocytogenesis in the bone marrow can be detected only with the onset of the general clinical symptoms (cessation of food intake, colic, immobility). It is expressed in a peripheral neutrophilia. The causal relationship between the accompanying leucocytosis and the stimulation of the bone marrow activity is obvious from the sequence in time. Even the anemic phase observed at times in the periphery after experimental infection in horses with Borna disease, and more frequently in sheep, is not based on a reduced erythropoietic activity. At any rate, the statistical evaluations of the sternal punctates during the course of the infection give no reason for such an assumption. This slight ephemeral anemia is based more on an increased consumption in the periphery, which is further evidenced by the fact that a slight hemosiderosis of stellate cells is frequently found in horses with Borna disease.

The conditions are similar in the case of an infection with the virus of Teschen porcine encephalitis. Only with the onset of the paralytic stage are exceptional tendencies toward activation in the sense of an increase of leucopoiesis observed. The over-all blood and bone marrow pictures reveal no particular cell changes. Accordingly, it is quite justifiable to assume that the idea that the occurrence of a leucocytosis or a leucopenia speaks more against than for a neurotropic infection applies also for the neurotropic infection of the pig with the virus of Teschen porcine encephalitis.

The study of the bone marrow cell changes in the case of swine influenza was favorably assisted by the fact that, in the preliminary experimental series, it was possible to produce lung affections by the virus of swine influenza both with virus-bacteria suspensions and with pure virus filtrates. This made it possible to study both the pure virus infection and the virus-bacteria effect. Following inoculation of the virus-bacteria suspension, an activation of granulocytopoiesis occurs, which corresponds, in the periphery, to a more or less certain leukocytosis. A slight prodromal leukopenic stage is present. The leukocytosis must be ascribed essentially to the bacterial portion of the suspension, since it is much less intensive in the pure virus infection. A somewhat aberrant behavior is shown by infections with pure virus filtrates. In them, the decrease of mature normoblasts, at least at the beginning of the fever reactions, is striking. Thus the impression of an inhibition of erythropoiesis. This numerical decrease of erythroblasts, however, exists only temporarily, and does not involve the stellate cells or the unmaturing forms, which do not decrease in number. As the disease develops further, the normoblasts increase; thus we can assume a direct or indirect activation of the erythropoiesis even in the case of virus pneumonia in young pigs. In the experimental animals used here, only in the stage of erythroblast decrease, in the periphery, could an anemia be established, which cannot be a simple suckling pig anemia.

A supplementary finding was the lymphocytosis in the case of acute swine influenza, which corresponded to a swelling of the lymphatic apparatus. Perhaps the Gumprecht's shadows which occur at times in the blood indicate a certain damage to lymphatic cells during the course of virus pneumonia. In general, few lymphatic reactions occur in acute infections, and pronounced lymphocytoses are an expression of reconvalescence and are thus postinfection lymphocytoses. The fact, however, that lymphocytoses also occur in the acute stage of virus pneumonia in humans justifies the assumption that the lymphocytosis observed in the case of swine influenza is likewise an expression of the acute infection. The changes in the bone marrow cells during virus pneumonia of pigs occur, as a rule, only when the clinical symptoms are present. Since secondary infections are already effective at this time, even in the case of infections with pure virus filtrates, an absolute separation of the effect of the virus from the reaction caused by the accompanying bacteria in the later phase of the disease is most difficult.

From the purely hematological viewpoint, the above three virus infections can be considered members of a common group, in which no, or only slight, changes of the bone marrow cell picture occur during the course of the disease, or, if certain reactions do occur, such changes are caused by secondary infections and are limited to a single cell system, as a rule, to granulocytopoiesis.

Conditions are different in the case of virus infections with a septicemic character, such as Newcastle disease, infectious anemia in horses, and hog cholera. In these infections, changes of the bone marrow occur regularly and are characterized particularly by an acute diminution of cells. Even though this cell diminution is not of uniform intensity in these three infections, the similarity of involvement of the three medullary systems, granulocytopoiesis, erythropoiesis, and thrombopoiesis, is striking.

Despite the usually acute course of the infection in Newcastle disease, changes with a varying degree of involvement are found in all three systems. The decrease of mature erythroblasts in the bone marrow parallels a retardation of granulocytopoiesis. In the periphery, the decrease of thrombocytes is clearly evident, and even the number of lymphocytes is lower. The fact that the decrease of erythroblasts in the marrow is not followed by an analogous decrease of erythrocytes in the periphery is explained on the one hand by the rapid course of the disease with long life of the erythrocytes, and on the other hand by the thickening of the blood, observed in Newcastle disease, which can disguise an already present anemia. Thus, in the course of Newcastle disease, an acute inhibition of hematopoiesis occurs, in which tendencies toward a myelo-insufficiency are observed. Since these changes appear in every case of the disease, even though with varying intensity, the assumption of a hemodynamic effect of this virus infection is justified. The inclination toward the development of such aplasias is shared by all acute general infections. The damage to the bone marrow is traced back to a considerable toxicoinfectious effect in such cases. The suppression of the function of the bone marrow can result in considerable general disturbances, even in sepsis. The short course of the disease and the special anatomical structure of the bone marrow in fowl would tend to preclude the development of marked, clearly diagnosed symptoms in Newcastle disease. Attention is called to the lymphopenia which occurs regularly in the case of Newcastle disease, and which must be interpreted as manifestation of lymphoreticular tissue damage also.

The variable cell picture of the bone marrow described for Newcastle disease is even more varied in the case of infectious anemia of horses. There is an alternation of hypoplastic and hyperplastic cell syndromes with those which show no essential variations of cell content. On the basis of the cell condition of the bone marrow, no explanation is needed for the fact that this virus infection is also characterized by a hemodynamic effect. At least in the acute course of the infection, the anemia, the granulocytopenia, and the reactive lymphocytosis of the marrow are unequivocally displayed. The relationship of the various cell pictures to pathogenesis is more difficult to interpret.

The fact that the anemia in the periphery, and even a part of the erythroblast-decrease in the bone marrow, are connected with the disturbed iron metabolism has been proved by many investigations. They do not explain, however, all the phenomena in the cell picture of the bone marrow, above all the quite variable cell conditions. Even though hemosiderosis in the liver and iron deficiency in the spleen occur so regularly in infectious anemia that they are utilized in diagnostics, such constantly occurring symptoms do not occur in the bone marrow. Assuming that the disturbed iron metabolism could be considered the sole cause of the anemia, these symptoms could also be expected in the bone marrow cell syndrome. In the bone marrow, however, quite variable cell syndromes appear. Periods of cell diminution alternate with periods of increased regeneration. The erythroblast increase directly before attacks of fever are particularly noticeable. Other factors must therefore play a role in the genesis of these changes in the cell syndrome, especially since granulocytopoiesis is similarly involved. This immediately suggests the possibility of a direct virus effect in the bone marrow itself, perhaps in the sense of a multiplication of the virus in the young cell parenchyma.

Titration experiments on bone marrow conducted by Bindrich in 1957, however, have shown that this is impossible, since virus titers in excess of the blood titers never occur in the bone marrow, at least in the case of the completely infectious virus. Whether an incomplete virus has any influence cannot be determined, since such a virus is not identifiable in the biological test.

Nevertheless, in the course of the disease, destructions of young cell forms of hematopoiesis, which point to certain toxic influences, can be identified. For instance, the occurrence of myelocytes with ring-shaped nuclei, of clover-leaf forms and double nuclei points to such influences. In form and effect, they suggest mitoclastic poisons, such as the effect of urethan. These changes occur particularly in the case of a protracted course of the disease.

In 1953, Potel and Schmidt observed a strong drop of serum iron as early as 24 hours post infectionem in the case of infectious anemia. On the basis of the fact that the serum iron level drops in every infectious disease and that this iron deficiency is to be traced back to its storage in the activated cells of the reticuloendothelial system, Potel and Schmidt assumed an early irritation of the tissue defensive apparatus, but left open the question of whether this activation of the reticuloendothelial system comes from a direct or from an indirect virus effect.

However, the very slight disturbances of the iron metabolism in the initial phase can scarcely be the cause of the inhibition of erythropoiesis. This is immediately precluded by the fact that the erythrocytes are hyperchromic in this stage. Even the changes of the granulopoiesis cannot be deduced from this finding. In 1957, Hoff found that the total regulation

of the blood syndrome, including the iron utilization, iron resorption, and hemolysis, seems to be subject to a central nervous-humoral control. Blood disturbances in the sense of an increase or diminution of blood cells would, under such a control situation, not only be explained by simply "too much" or "too little" blood cell substance, but also by the disturbances of this control. The neuroautonomic influence exerted in the initial phase via the central-nervous influences would have to be a sympathicotonia. It would thus explain the normoblast decrease and the decrease of mature white cells in the bone marrow as an organ predominantly innervated by sympathetic fibers, and, via the epinephros splanchnici and its branches in the liver, spleen, and adrenal gland, would make possible the activation of the reticuloendothelial system and of the adrenal reactions.

The cell formation and cell multiplication which occur directly before the febrile phase, would then be based on a parasympathetic, histiotropic effect. This seems to be possible, inasmuch as the rapidly ensuing fever is an expression of an increased diffusion of virus into the periphery, with which a temporary cessation of the nervous effect can be connected, with the result that the antagonistic effect of the parasympathica would take over the histiotropic function as a substitute for cell atrophy. In the case of such an interplay of a sympathetic, ergotropic reaction in the bone marrow and the antagonistic, histiotropic, parasympathetic effect, an explanation could be given of the cell syndromes in subacute and chronic cases in which hypoplastic and hyperplastic structures alternate. This neuroautonomic regulation of the defense mechanism with temporary inhibition, substituted function and renewed inhibition of hematopoiesis would be in good agreement with the cyclic course of the multiplication of virus.

The neuroautonomic participation in the defensive mechanism seems to stem also from an additional finding in the bone marrow and blood. The assumption that a sympathetic effect seems to be exerted shortly after infection, which could also be responsible for the adrenal reactions, is confirmed by the presence of eosinophilic reactions in the bone marrow and in the blood. In infectious anemia, considerable decreases of the number of eosinophils in the blood are detected very early, whereas their number remains almost unchanged in the bone marrow. This divergence is not surprising, since the eosinophils very often display an opposite behavior in other cell systems. The decrease of eosinophils in the periphery, however, indicates an increased activity of the adrenal cortex. According to Rosenthal, Etess, and Litwins, a significant decrease of eosinophils in the blood occurs after the administration of Cortisone, whereas the number of eosinophils in the bone marrow remains almost unchanged. From this viewpoint also, the introduction of autonomic impulses from a nervous center which controls the adrenal glands and hematosis synchronously is plausible. Under the conditions stated, however, these could only be effects which are conveyed via the sympathicus.

Naturally, it cannot be said that the neuroautonomic disturbances are the sole agent for the anemia and the leukopenia. Along with the nervous influences, a considerable role must also be played by the humoral, allergic, and immunohematological processes, the influences of which, however, cannot be ascertained solely from the bone marrow cell syndrome.

The findings in the periphery in the case of infectious anemia, which seem to explain the early disturbance of the capillary permeability in the parenchyma of the bone marrow, have shown that, directly before the onset of fever, immature forms of bone marrow cells are observed in the periphery, which can never be proved by physiological methods. One exception is the agonal outbursts of such cells after acute general infections. According to the hematological directions of Rohr (1949), the occurrence of immature bone marrow cells in the blood is always connected with a myeloid metaplasia. There is also the opinion that immature cell forms can appear in the periphery even without metaplasia, if disturbances or lesions have occurred at the capillary endothelia in the bone marrow. Since however, in infectious anemia (aside from the tissue changes in the liver and spleen, which represent proliferations of lymphoid cells), no occurrences of such a metaplasia can be observed, the occurrence of immature cell forms in the blood of horses with anemia probably is to be traced back to the functional disturbances in the vascular endothelia in the bone marrow.

In the case of an infection with the virus of hog cholera, such a regular, detailed, repetitious bone marrow syndrome occurs that this disease has a particular position among the group of virus infections with septicemic character. The always present leukopenia and the anemia are, as research has shown, primarily an expression of a disturbance of medullary hematopoiesis, whereby erythropoiesis and leukopoiesis are equally involved.

The irritation which inhibits hematoses sets in relatively soon after infection. This is shown by the bone marrow cell syndromes from the individual infection stages and also the functional tests on erythropoiesis by the reticulocyte test and of leukopoiesis by the application of Coli-vaccine. As early as 24 hours post infectionem, in hog cholera, there is a significant decrease of reticulocytes, which must be interpreted as an inhibition of erythropoiesis. This postinfection inhibition of erythropoiesis was particularly evident in a series of experiments in which there was an initial, significant increase of bone marrow output, characterized by reticulocyte increase. Although such a burden had released a vigorous erythropoietic activity by the bone marrow from one to 2 days after infection, the amount of reticulocytes decreased from 30-40 percent to a few parts per 1,000, or disappeared entirely, without ever increasing again during the entire course of the disease. From this sudden and quite extensive disappearance of reticulocytes, the conclusion is drawn that the irritation which inhibits erythropoiesis is produced very suddenly, very vehemently, and very soon after infection. This reticulocyte decrease contradicts the presence of a primary oxygen deficiency in the blood in the case of hog cholera, as was suggested by Matthias (Arch. exp. Veterin-aermed., Vol 11, 1957, pp 43-114) on the basis of his adrenal gland findings;

Mertens (Zschr. Zellforsch., Vol 46, 1957, pp 484-488) showed that a hypoxia would stimulate the hematopoietic system toward a considerable increase of reticulocytes. If Matthias' assumption should prove correct, the irritation caused by the oxygen deficiency would have to be subordinate to that which inhibits erythropoiesis.

In a hog cholera infection, the considerable inhibition of granulocytopoiesis, in addition to that of the erythropoiesis, must be considered the cause of the peripheral leukopenia. Here, too, the mature cell forms disappear from the bone marrow shortly after infection, and, as the disease progresses, there is a considerable shift to the left of granulocytopoiesis, with considerable diminution of cell numbers. The fact that this inhibition increases steadily is shown by function tests of granulocytopoiesis with the Coli-vaccine test. The fact (proved by Moeschlin, Zach and Gebert, and Benkoe) that such leukerethistic substances as Pyrifer, Lipopolysaccharide, and Coli-extract become effective via autonomic and central-nervous-system paths perhaps indicates similar mechanisms of effect in the pathogenesis of hog cholera.

The initial decrease of mature white cells in the bone marrow must, perhaps, as in the case of infectious anemia of horses, and perhaps even Newcastle disease, be traced back to a sympathicotonic influence. However, this does not explain the increase of insufficiency of both medullary systems, which has been found to be characteristic of hog cholera infections.

The fact that a direct virus effect on the bone marrow can be excluded has been proved by virus content determinations on extensively blood-free bone marrow (Pehl and Schulze, Arch. exp. Veterinaermed., Vol 12, 1958, pp 861-869). The toxic component of the virus, which is without doubt present, according to the cell syndromes, and which is expressed in the morphology of the individual cell by the occurrence of ring nuclei, cloverleaf forms and double nuclei, can, at most, be held responsible for a part of the cell diminution, since the cell changes are always observed in a relatively late stage of the disease and are low in number. Experimental findings also preclude a depressive spleen effect as a cause of the bone marrow insufficiency. It is possible that a functional antagonism between the myeloid and lymphatic system has a causal connection. Lymphatic hyperplasias are often connected with the atrophy of specific marrow tissue (panmyelophthyses). Similar antagonistic effects might be concluded here too, in the light of the hyperplasia of the entire lymphatic apparatus and myeloid insufficiency in the case of hog cholera.

Perhaps the receptor field for a neuroautonomic inhibition of the bone marrow might be shifted into the predominantly parasympathetically innervated lymphatic system. Experimental findings support this. Pehl and Schulze (see above) found in extensively blood-free washed organic material of pigs infected with hog cholera a particularly early and high virus content in the lymph nodes, from which a vagus effect could very well result.

From the involvement of both systems (erythropoiesis and granulopoiesis) in the case of hog cholera, from the general behavior of the changes in the cell pictures in the bone marrow, and from the parallelism between virus multiplication and response to stimuli, it must be concluded that the point of attack and the intensity of an established irritation, rather than its quality, are important. The explanation of the genesis of the changes of the cell picture as a result of toxic influences is thus unsatisfactory, since toxins have not yet been established in the case of hog cholera. Moreover, the sudden, vehement onset of the irritation from virus multiplication seems, directly or indirectly, to produce such a considerable and effective irritation of the entire apparatus which controls hematopoiesis that a prolonged deficiency of hematosiis results. Here the influence via the neuro-autonomic paths, which causes a nonspecific, but nevertheless particular, defense against infection for this virus infection, must be of special importance.

From the purely morphological viewpoint, only a hypothetical interpretation of the pathogenesis is possible. No claim is made that the mechanisms discussed here are the only ones possible. Hematopoiesis is controlled by so many different factors that even an excessive or deficient activity of only one of the systems controlling hematosiis can lead to the most varied cell syndromes in the bone marrow. In 1957, for example, Hoff showed that, quite different syndromes can arise following the application of bacterial enzymes, which become effective via the diencephalic center which regulates hematosiis in association with neuroautonomic impulses from the splanchnic region. Small amounts of such enzymes produce a leukocytosis, whereas leukopenias result from excessive dosages.

A comparison of the changes of the bone marrow cell syndrome in virus infections of a septicemic character (Newcastle disease, infectious anemia of horses, and hog cholera) shows a certain parallelism, at least with respect to Newcastle disease, hog cholera, and the acute form of infectious anemia of horses. The changes occurring in the initial stage are first of all an expression of the general infection and of the general defense against infection, such as occur in any other infection. The particular type of irritation produced in these virus infections, however, particularly the intensity and the suddenness of occurrence, can be considered, in the ensuing course of the diseases, to be special defensive reactions against infection triggered primarily via central nervous and neuroautonomic paths and peculiar to these virus diseases. Thus these types of viruses have a special hemodynamic effect.

On the basis of the present status of knowledge, no extensive conclusions can be drawn regarding the significance of the changes of bone marrow with respect to the pathogenesis of the virus infections studied. According to the above-described findings and experiments, a direct influence on the bone marrow by the pathogens is improbable. Only an indirect virus effect might come into question. The question of where, within the mechanisms which control hematosiis, the individual viruses attack, either directly or indirectly, can be answered only by further appropriate experimental investigations.

Virology

129. Reversibility of Inactivation of Tobacco Mosaic Virus Observed

"Action of Certain Antibiotics on Tobacco Mosaic Virus,"
by A. D. Bobyr, Institute of Microbiology, Academy of Sciences
Ukrainian SSR; Kiev, Dopovidi Akademii Nauk, Ukrainskoy RSR;
No 12, 1959, pp 1358-1363

The results obtained in an investigation of the action of certain antibiotics on the tobacco mosaic virus (TMV) on the leaves of N. tabacum, Havana variety, are presented in this paper. It was established that the antibiotics imanine, arenarine, gramicidin, microcide, and the new antibiotic 1604, obtained from Pen. urticae, strain 1604, considerably depress the tobacco mosaic virus activity in isolated leaves and entire tobacco plants. The most active of them is imanine. The results obtained with antibiotic indicate that it is a promising agent for fighting Tobacco Mosaic Virus.

Inactivation of the virus, caused by the antibiotics tested, at comparatively low concentrations, is partly or completely reversible on titrating the virus on very young indicator leaves of N. glutinosa. The concentration of these antibiotics and the duration of their action affect their antiviral activity as well as the reversibility of virus inactivation. In this connection, it will be necessary to check for reversibility in the induced inactivation of the virus when selecting an antiviral substance for therapeutic purposes.

130. Chinese Study Coxsackie Viruses Isolated in Fukien Province

"Survey of Coxsackie Virus Diseases in Fukien Province," by
Wu Chiao-ju (吴 蛟 如), Ch'en Chin-liang (陈 锦 良),
and Wu Kuei-ch'ing (吴 桂 卿), Fukien Institute of Epidemiology;
and Lin Shou-ch'uan (林 守 铨), Foochow City Infectious
Hospital; Peiping, Chung-hua I-hsueh Tsa-chih (National Medical
Journal of China), Vol 46, No 1, 25 Jan 60, pp 40-48

The authors report an epidemiological survey of Coxsackie virus diseases in Fukien Province in 1958. The survey was based on the study of 55 strains of Coxsackie viruses which they isolated from laboratory specimens collected during January-August of that year. The specimens which yielded the viruses included stools and throat washings of patients and normal persons and three batches of insects each consisting of more than 100 flies.

E. A. Beeman's method (1952) of isolation by infant mouse passage was employed. The viruses were determined by J. L. Melnik's criteria for the Cocksackie group.

For typing purposes, the authors prepared antisera for the serotypes A₁, A₂, A₅, A₆, A₇, A₈, A₉, A₁₀, B₁, B₂, B₃, and B₄, using standard strains obtained from the Department of Virology, Chinese Academy of Medical Sciences, Peiping. All of the above serotypes, except A₁₀, were identified among the 22 strains they tried to type. One strain was found to be a type for which they had no antiserum.

The epidemiology of Cocksackie virus diseases is discussed. The authors conclude that they prevail in Fukien Province throughout the year, the incidence reaching a peak in July and August.

Miscellaneous

131. Collection of Microorganisms

"Museum of Microorganisms" (unsigned article); Moscow, Meditinskiy Rabotnik, 3 Jun 60, p 3

"The organization of an All-Union Museum of Pathogenic Microorganisms at the State Control Institute of Medical and Biological Preparations imeni L. A. Tarasevich and its affiliates has been completed. The museum, which is a part of the International Organization for the Collection of Microorganisms, gathered many strains of pathogenic and nonpathogenic microorganisms, and is now engaged in the study, description, and cataloging of the microbes. New organizational forms and the participation of scientific research microbiological establishments in this work are required. The Ministry of Health USSR suggested that the ministries of health of the union republics take steps to expand the museums of microorganisms at the institutes of epidemiology, microbiology, and hygiene, and vaccines and sera, to provide the institutes with trained personnel, and to supply them with the necessary materials and culture media. The Institute of Epidemiology and Microbiology imeni Gamaleya has been entrusted with the task of: organizing affiliates of the All-Union Museum for the study of strains of brucella, listerella, and tularemia microorganisms."

132. Forensic Medicine Facilities

"On the Organization of Interoblast Forensic Medicine Laboratories," by V. I. Prozorovskiy and E. I. Kanter, Scientific Research Institute of Forensic Medicine, Ministry of Health USSR; Moscow, Sudebno-Meditsinskaya Ekspertiza, Vol 3, No 2, Apr-Jun 60, pp 3-7

The need for reorganizing the existing forensic medical laboratories, coordinating their work, and organizing new interoblast facilities is stressed in the article. Although the Supreme Soviet USSR, at its 25 December 1958 session, adopted a number of laws bearing on criminal legislation, court procedures, and criminal jurisprudence in the USSR and the union republics, little has been done to implement these laws. In the Ukraine, for instance, a territory of 25 oblasts having a widely developed network of railways and highways, there are only 13 forensic medicine laboratories. Only ten of these have facilities for examining medical and chemical evidence. The same is true of a number of other republics. All these laboratories are operating on an individual basis without contact with the other laboratories. The authors urge the coordination of the work of existing laboratories, the organization of interoblast laboratories, and the training of laboratory personnel.

VIII. PHYSICS

Mechanics

133. Explosion in Medium With Linear Density Distribution

"Linearized Solution of the Problem of an Intense Explosion in a Medium With Linear Density Distribution," by V. P. Karlikov, Chair of Hydrodynamics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 1, Jan/Feb 60, pp 60-65

The actual linearization was done in an earlier work by the author (Vestnik MGU, Seriya Mekhaniki, Matematiki, Astronomii, Fiziki, Khimii, No 4, 1959) for the case of a point explosion in a medium with a given initial density distribution; here, the results are given for a medium with an initial linear density distribution.

One characteristic feature of this solution is the variation of sign of the transverse component of velocity, which is always positive at the shock wave and near it and becomes negative as the vicinity of the center of the explosion is approached radially; consequently, this area cannot be considered from the viewpoint of linear theory. On each intercept of a half-line between the limits of such an area and the shock wave, there is a point at which the transverse component of velocity is reduced to zero; thus the over-all velocity has a strictly radial direction. On the segment between the boundaries of this zone and the point mentioned above, the gas particles intercept the half-line, moving counterclockwise, and move clockwise on the segment between this point and the shock wave. It is as if there were an upward motion of the gas within a certain area around the center of the explosion.

The values for the functions used in the solution here are tabulated in the author's 1958 Moscow State University dissertation [title not given].

134. Twisting of Reinforced Circular Cylindrical Shell

"Twisting of a Reinforced Circular Cylindrical Shell With a Rectangular Slot," by S. I. Galkin; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 4, 1960, pp 15-28

A solution is given of the problem of a circular cylindrical shell with a rectangular slot and reinforced by elastic ribs. It is assumed that the reinforcing ribs divide the enclosed portion of the shell into equal sections. The open portion of the shell, consisting of two sections, is supported at

the inside edge by ribs. The longitudinal edge of the open part is free of beam-type longitudinal reinforcements. It is further assumed that the shell casing acts as a thin momentless shell subjected to axial and tangential forces; the Poisson coefficient is assumed to be equal to zero; the ribs have a finite bending strength in their own plane and a zero bending and torsion strength outside their own plane; the ribs are connected peripherially to the shell; the radius of the neutral axis of the ribs is equal to the radius of the mean surface of the shell.

From an analysis of curves, it is concluded that the strength of the ribs has a very great influence on the magnitude and character of the distribution of tangential and axial forces across the open part of the shell. When the strength of the ribs is low, there is a concentration of both tangential and axial stresses close to the longitudinal edge of the open slot.

135. Downward Propagation of Shock Wave Through Compressible Fluid

"Propagation of a Shock Wave Down Through a Compressible Fluid," by A. G. Bagdoyev and A. A. Arutyunyan, Chair of Wave and Gas Dynamics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 1, Jan/Feb 60, pp 37-42

This article considers the problem of the propagation down through a compressible fluid of a shock wave originating at a point explosion above the free surface of the fluid, occupying the lower half space.

The parameters are calculated in dimensionless form, and formulas are given for the conversion into real values.

136. Nonrelativistic Velocity and Damping of Weak Perturbations in Radiating Gas

"On the Velocity of Weak Perturbations and the Existence of Weak Shock Waves in a Radiating Gas in the Presence of Radiation Pressure," by V. A. Prokof'yev, Chair of Aeromechanics and Gas Dynamics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 1, Jan/Feb 60, pp 43-59

On the basis of the hydrodynamic equations of Navier-Stokes, and taking into account the mechanical action of an equilibrium radiation, this article considers the propagation of plane harmonic weak perturbations (pressure and thermal waves) in an equilibrium medium at rest, the thermal and calorific states of which are given in very general form. For the adiabatic sonic velocity, a formula is derived which takes the radiation pressure into account, and a characteristic (frequency) equation of the Kirchhoff-Langevin type

(considered by Truesdell [Journal of Rational Mechanics and Analysis, Vol 2, No 4, 1953, p 643] without accounting for the radiation field) is obtained which affords the possibility of determining the velocity of weak perturbations and their attenuation under the influence of viscosity and thermal conductivity.

The treatment here is limited to nonrelativistic conditions.

Nuclear Physics

137. Photon and Atom Diffusion

"Simultaneous Diffusion of Photons and Excited Atoms," by B. A. Veklenko, Moscow Power Engineering Institute; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 2, 1960, pp 64-74

Green's function was obtained for an equation expressing the simultaneous diffusion of photons and excited atoms in a unlimited uniform space. The asymptotic properties of the equation were analyzed. Those physical conditions were determined under which individual transition mechanisms can be neglected.

138. Paramagnetic and Cyclotron Resonance

"Determination of the g-Factor From Comparison of the Frequencies of the Paramagnetic and Cyclotron Electron Resonances," by V. N. Lazukin, Moscow State University imeni Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 5, Apr 60, pp 1064-1066

A device was designed which detects microwave power after passing a resonator and displays the cyclotron resonance absorption line, its relation to several factors, and the paramagnetic electron spin resonance under the same conditions. The observations confirmed theoretical anticipations regarding the shape and width of the cyclotron resonance absorption line as a function of time of electron interaction with the emitting field, the density and energy of the electron beam, collisions with molecules of the residual gas, and the power of microwave oscillations in the resonator.

139. New Theory of Superconductivity

"Extension of Gorkov's Method to the Case of Electron-Phonon Interaction," by M. V. Buykov, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 3, May 60, pp 561-564

The theory of superconductivity involving Green's functions was first developed by Gorkov (ZhETF, 34, 735 (1958)) and is based on the model of four-fermion interaction. The theory of superconductivity is analyzed here by the same method, with the use of only the real interaction of electrons and phonons. The theoretical equations are derived without allowance for Coulomb effect and without the assumption of a very small bond constant.

140. Betatron Emission

"Stabilization of the Dosage of a Betatron Emission," by G. A. Kabanov, Tomsk Polytechnical Institute imeni Kirov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 2, 1960, pp 81-84

Equipment for stabilizing the emission dosage of a betatron is suggested. The schematic of the equipment is described, and the results of its operation are presented. The equipment is considered of special value in medical applications and for defectoscopy.

141. Thermal Conductivity in Plasma

"Problem of Thermoconductivity in a Fully Ionized Plasma," by Yu. A. Pekar, Tula Mining Institute; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 2, 1960, pp 99-102

The temperature distributions of electrons and ions in a fully ionized plasma were obtained. The computation of the ratio of the thermal conductivity coefficient to temperature involves serious mathematical difficulties in the case of a cylindrical plasma; therefore, a plasma contained between two parallel heat conducting walls is analyzed for conditions when the current density of the cross section is constant in two extreme cases: strong or weak absence of isotherms. The radiative losses of electrons may be computed only if the whole electron energy is radiated or if the ions transfer all their energy to electrons and the latter radiate it.

142. Rumanian Nuclear Physics Research

"The Development of Nuclear Physics in Our Homeland," by Arpad Szabo, staff member of a special department in the Atomic Physics Institute (Atomfizikai Intezet); Cluj, Korunk, Jun 60, pp 651-653

This article is a general review of the history of postwar physics research in Rumania.

In 1949, the Physics Institute (Fizikai Intezet) of the Academy of the Rumanian People's Republic was formed within the framework of Academy Special Department I; this institute was established in Bucharest and was provided with "the most modern laboratories and shops." At the same time, physics work groups were established in Cluj, Iasi, and Timisoara.

In 1955, an Atomic Energy Committee (Atomenergia-bizottsag) headed by Comrade Gaston Marin was set up for the Council of Ministers of the Rumanian People's Republic; this committee was charged with coordinating all activities connected with the peaceful use of atomic energy.

In 1956, the academy's Physics Institute in Bucharest was transformed into a "powerful scientific atomic research center" under the leadership of Academician Horia Hulubei. Since then, general physics research has been continued by a new academic physics institute in Bucharest headed by Academician Eugen Badarau.

The Atomic Physics Institute (Atomfizikai Intezet) was provided with "the most modern equipment" by the Soviet Union, and its workers were given the opportunity to study in the atomic physics institutes of the Soviet Union. There are five special departments in the Atomic Physics Institute: nuclear physics, nuclear spectroscopy, nuclear technology, radiation measurement, and radioactive and stable isotopes.

The first nuclear reactor in the institute was put into operation on 31 July 1957 with a capacity of 2,000 kilowatts, the basic equipment coming from the Soviet Union. The capacity of the reactor has been raised subsequently to 3,000 kilowatts, and a large quantity of artificial radioactive isotopes has been manufactured.

On 14 January 1958, a U-120 cyclotron (particle accelerator) was put into operation; it also came from the Soviet Union. Its electro-magnet poles weigh 120,000 kilograms and are 1.2 meters in diameter. Its high frequency generator has a capacity of 120 kilowatts.

In May 1958, a cosmic ray laboratory was put into operation; it has Europe's largest water basin for studying the properties of cosmic radiation. The largest part of its equipment was manufactured in shops of the institute. Workers in this laboratory are also involved in the study of nuclear emulsions registered by the 10 billion MeV [sic; evidently 10 BeV is meant] synchro-phasotron in Dubna.

In addition, the article continues, a number of other laboratories were built or are under construction: radiochemistry, electronics, and laboratories dealing with semiconductors and separation of stable isotopes. Large, modern shops have been built to provide equipment.

Research results mentioned are: a study of reactor dynamics, a study of the plasma theory of totally ionized gases, research on mutual effects of nuclear particles and on physics of neutrons, and studies in radiochemistry and theoretical physics.

Similar research is also done in various university laboratories and institutes subordinate to the various ministries.

Radioactive isotopes are used in the petroleum industry -- Co^{60} , Zn^{65} , and I^{131} are used to follow exchange processes between various petroleum and underground water strata. These methods have resulted in the saving of 60 million lei, the article says.

Isotopes are also used in the chemical industry -- for radiolysis, radiocatalysis, polymerization, etc. Tagged atoms are used to study the dynamics of chemical processes. A special laboratory is working on the production of chemicals to prevent radiation sicknesses, and it is also studying the pharmacodynamic effects of these, the article states.

The academy chemical institute in Cluj is also doing work with tagged atoms under the leadership of Academician Professor Raduca Ripau. This work has included a determination of the structure of strontium hexameta-phosphor.

Defectoscope experiments on lubrication of machine parts are being done in the academy's applied mechanics institute, the Traian Vuia Institute.

The Fifth Special Department of the Atomic Physics Institute (in Cluj) is also developing ways to use radioactive isotope methods in the ceramics, glass, firebrick, chemical, and metal industries of Cluj Province.

Radioactive isotopes are also being used by the G. I. Parhon Endocrinology Institute in Bucharest to study iodine metabolism and interdependencies between hormones and endocrine factors in connection with the biochemistry of tumors. Radioactive silver is being used in the infra-micro-biology institute to study the spreading of antirabies serum virus in tissues.

The Rumanian Atomic Physics Institute has cooperative contacts with the atomic research institutes of the Soviet Union, Czechoslovakia, Bulgaria, Hungary, East Germany, and France.

Solid State Physics

143. Anisotropic Conductivity in Germanium

"Anisotropy of the Galvanometric Effect in the n-Type Germanium Crystal at Temperatures Confined Within the Transient Conductance Region," by R. G. Annayev and A. Allanazarov, Physicotechnical Institute, Academy of Sciences Turkmen SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 3, May 60, pp 557-560

Previous research by the authors concerning longitudinal and transverse galvanometric effects along the main crystalline axes at room temperature in a Ge single crystal (DAN, Vol 118, No 1, 1958, p 47; Izv. AN Turkm SSR, No22, 1960) is further developed by studies of anisotropy of this effect in the same crystalline body at temperatures in the region of transition from impurity conductivity to intrinsic conductivity. Anisotropy with respect to the transverse and longitudinal axes was found at all temperatures. Theoretical analysis indicates that values of cross sectional effect along the $[001]$ and $[110]$ axes should be equal, but experimental results at a specific magnetic field differ from theory.

144. Dielectric Strength of Solid Dielectrics

"Criteria of Breakdown of Solid Dielectrics," by V. D. Kuchin, Tomsk Polytechnic Institute imeni Kirov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 2, 1960, pp 161-162

The electric strength of solid dielectrics is evaluated by analyzing the interaction of electrons accelerated by the external electric field with lattice oscillations. An equation is derived for computing the electric strength of solid dielectrics and its relation to the time of the applied voltage and temperature.

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